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China Report

SCIENCE AND TECHNOLOGY

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CHINA REPORT

SCIENCE AND TECHNOLOGY

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NATIONAL DEVELOPMENTS

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Technology Transfer Within China

Tianjin KEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 12, 12 Dec 84 pp 19-22

[Article by Guo Fansheng [6753 0416 3932]: "Comments on Gradient Technology Transfer Within China--A Discussion With He Zongxiu [0149 6988 4423] and Xia Yulong [0007 4416 7893]"]

[Text] Editor's note: Since comrades from the Strategy Group of the Communist Party Politics Research Office of Inner Mongolia published a theoretical discussion on "Gradient Technology Transfer Within China" in the article entitled "Fundamental Countermeasures for Economically Underdeveloped Areas to the New Technological Revolution", we received many letters and manuscripts with opposing views. The general opinion is that the article mixed two separate fundamental issues. It confused the unification of the relations among different internal regions of a socialist country with that of nations of different social systems in the world. Second, it mixed up bringing in foreign capital, technology, equipment and talent with technology collaboration and transfer within China. They believe that there is not enough basis to oppose any general tradient theory based on some unpleasant experience in the past or present. It would be lopsided to believe that importing foreign technology at any time anywhere will have the same benefit regardless of existing foundation and capability to digest the technology. However, we know that the author is young and energetic, and the article did bring up many examples and viewpoints which are shared by many comrades in the inland and remote areas. In addition, the discussion was carried out with the editor and associate editor of this publication. In spite of our disagreement with the basic idea and final conclusions, the editing committee decided that it should be published for study.

The theory of gradient technology transfer within a country hold that there is an economic and technological gradient in China because of an imbalance in the economic development due to historical reasons. Usually, advanced technologies are introduced to certain established areas first and then transferred to "intermediate technology" and "traditional technology" areas according to the gradient. It costs less and benefits more. As the economy grows, regional differences will be reduced through accelerated technology transfer. This seems to be a fast and inexpensive approach.

The theory of gradient technology transfer accurately points out the fact that there are three economic and technical levels in China due to imbalanced productivity development. It is an unusual step in the study of scientific and economic theories, as well as in the research of policies, that the unrealistic policy over the past 30 years which demanded overall economic development in all regions to the same level is criticized. From the viewpoint of historical materialism, we must objectively admit the academic value of the theory of gradient transfer. However, we are facing the challenge of a new technological revolution. In view of the trend of development, this theory has major defects and mistakes and is already impractical. If it is not corrected, it will have a detrimental effect on the growth of underdeveloped areas as well as on the prosperity of the entire country. Therefore, this subject is under discussion.

I. The major source of error of the theory of gradient transfer is its inability to break away from old concepts.

First, the basis of the theory of gradient transfer is to consider China a closed society. In important technology transfer areas such as the import of foreign capital, technology, equipment and talent, as well as in domestic technological collaboration, the restrictions imposed by the old concept, system and management principle remain in effect. It is believed that underdeveloped areas do not have enough qualified people (personnel transfer was not possible in the old system) and these areas cannot leap over developed or developing regions by relying on their own accumulated capitals, therefore, there is no large scale development in these regions. However, the closed system in China is being taken apart as measures to reform are adopted. China not only opened up 14 coastal cities for trade but also brought in capital and technology to develop underdeveloped (third level) areas. As a typical example, a contract was recently signed with an American company which would bring in billions of capital to intensively exploit the coal resources in Pingshou, Shanxi which is a technically and economically underdeveloped area. As long as our thoughts are liberated and policies are relaxed, it is possible to put this area in the leading position of the nation in a series of major technologies such as open pit coal mining, ultrahigh voltage power transmission, large scale thermal power generation, coal liquefaction, chemical engineering, low temperature area construction, waste treatment, enrivonmental protection, and quality control and production process management by microelectronics. The transfer of technology will also leap forward. Therefore, China not only can bring in foreign capital and advanced technology to developed regions where economic, technical and

personnel advantages exist, but also is opening up a second "route to riches" by attracting foreign investment and technology to underdeveloped areas with abundant resources. If this second approach is not available, China will not be able to achieve the strategic goal of "quadrupling its economy" by the end of this century. Thus, from the viewpoint of progress, the pattern of technology transfer as recognized by the gradient transfer theory is being negated by reforming the socialist buildup practice.

Second, from the viewpoint of the history of science and technology, there are three basic directions of transfer. One if the transfer to commercial and business regions. For example, technology is transferred to Singapore, Hong Kong, Taiwan and certain areas in Guangdong. Second, it is transferred to areas with higher intelligence and productivity levels. For example, technology is transferred to Japan and the economic zones in Shanghai, Beijing, Tianjin and Tangshan. Third, it is transferred to resource abundant regions such as oil-producing countries in the Middel East, as well as Shanxi and Inner Mongolia in China.

In the past decades, the third direction of technology transfer performed poorly in China. The cause is the closed society policy. Thus, the direct import of advanced foreign technology into underdeveloped areas was limited and technology exchange within the country was also hindered. Moreover, the emphasis was to be independent. Consequently, it was not possible for an underdeveloped region to attract foreign investment and technology by relying on its abundant resources to make some significant progress. Before oil resources were exploited, the productivity and technical standard in Middle Eastern countries were far behind those of Inner Mongolia, Gansu and Xinjiang. They were also be attract large amounts of capital, technologies, and qualified people by using their resources to develop their economy and technology to the second world level. The USSR began exploiting its eastern region in the 1960's, which is another example of apparent economic and technological improvement. The eastern region in USSR includes the Far East and Siberia. It has more than 50 percent of the total area in Russia. The population is approximately 2.8 million, which is roughly 11 percent of the Soviet population. A rough estimation indicates that it has more than two thirds of the Soviet's resources. However, due to a hostile climate, productivity prior to exploitation was very low. The USSR began to intensively exploit this area on a large scale in the 1960's. More than 50 billion rubles were invested in (?Queming) oil field alone from 1964 through 1980. Since the 1960's, approximately 30 percent of the investment has been spent in the east. The investment is much heavier by proportion. Large foreign loans and technologies and advanced equipment for exploration, transporation and remote control poured into this area. A series of important technologies such as the world's largest diameter gas pipeline, the most advanced high pressure pumping station, the technology of pumping natural gas into the ground to squeeze out more oil, and a highly efficient chemical to prevent sedimentation in underground oil drilling equipment were first applied in that area. In addition, the development of the west coast in the U.S. and (?Luer) industrial zone in Germany in the last century also led to significant leaps. From the historic data, the present gradient transfer pattern based on productivity cannot fully reflect the characteristics of technology transfer.

Third, we are facing the challenge of a new technological revolution. Since the new technological revolution offers a breakthrough opportunity to underdeveloped nations and all nations are at the same starting point, why is the same rule not applicable to developed and underdeveloped regions in a country? We should liberate our thoughts and relax our policies to allow resource abundant areas to attract new technologies generated in the third and fourth industrial revolutions to reform and develop their own traditional industries. They should be allowed to take off with those developed regions. It does not make any sense for an underdeveloped area to always take over outdated equipment and technology from developed or developing regions. In fact, underdeveloped regions are capable of directly absorbing imported technologies. For example, the Tianshan knitting factory in Xinjiang and Yimeng Textile Corporation in Inner Mongolia directly brought in foreign technology with good economic results. The quality of a wool sweater manufactured in Inner Mongolia has already exceeded that made in Shanghai and Beijing. The retail price is also the highest in the country. The productivity of finished wool also surpasses that of Shanghai. The Second Wool Textile Mill of Inner Mongolia is the first in the nation to control dyeing with a spectrophotometer. In the use of microcomputers, good results have also been obtained. In recent years, over 100 million yuan have been invested on a large sugar plant and textile mills. Because of using technology and equipment retired from the first and second levels in the 1960's, we are loosing money from day one.

In summary, the gradient transfer theory was based on the old concept, system and management. It is not compatible with the new trend and does not agree with the "creative" strategy to meet the challenge of the new technological revolution. Moreover, it is causing our economic development to suffer losses. Therefore, we should not abide by it any longer.

II. Deduction problem caused by one-sidedness in theory and in comprehension of practice is another fault of gradient transfer theory.

First of all, there is a lack of understanding on the overall imbalance of productivity development. We believe that the imbalance is absolute and the balance is relative. Therefore, increasing gap between developed and underdeveloped areas coincides with the pattern of imbalanced productivity growth. Of course, this is only one aspect of the pattern. The other important aspect is that an underdeveloped region or country may catch up with a developed region by taking advantage of certain favorable conditions and adopting corrective measures. The West coast of the U.S. is surpassing the developed East, the rise of Shanghai in the late Qing Dynasty, and the challenge of developing cities such as Changzhou and Wuxi to Shanghai are good examples. This point is neglected by the gradient transfer theory. Instead, this type of growth is considered to be an exception.

Second, in the papers written by He Zongxiu and Xia Yulong the following example was given to emphasize the importance of the industrial bases in Tianjin, Shanghai, Liaoning and Jiangsu in order to subsequently derive the conclusions of the gradient transfer theory. "The modern Japanese economy

grew from Tokyo Bay and Osaka Bay and extended into the (?Yishi) Bay and (?Lihunaihai) coast. The area of these four economic zones has 22 percent of the total land in Japan. However, the industrial output is 80 percent--including 85 percent of the metallurgical industry, 91 percent of the oil refining capacity and 94.6 percent of the ethylene production capability." We believe that China is very different from Japan and this example is not conviencing. Japan is a resource-poor country. It relies on imported resources.

Therefore, it was rational that the Japanese industries began to grow from natural ports such as Tokyo Bay and Osaka By. China, on the other hand, is rich in resources. They are primarily distributed in the inland and underdeveloped areas. It is not necessary to concentrate 80 percent of the industries along the coast as Japan. Metallurgy, coal, oil and construction material industries in the USSR, U.S. and West Germany are mainly located in resource abundant regions. The policy to imitate the Japanese to build Baoshan Settl Base is a mistake in view of the productivity layout. This example illustrates the unsoundness of the gradient transfer theory which leads to the wrong conclusion.

III. Is the gradient technology transfer in China a pattern?

According to statistics, industries in China are divided into a dozen or so trades such as metallurgy, machinery (including electronics), power, coal, petroleum, chemical and textiles. There are more classes in light and heavy industries.

From the productivity layout, the economic effect would be better if the excavating industry, raw material industry, light agricultural product industry, and some manufacturing industry are built near resource-rich areas. This part of industry accounts for more than 70 percent of fixed capital in China. The remaining industries are economically better off near or in an established industrial area. From the distribution of unexploited resources in China, most of the new excavating and raw material industries should be built in underdeveloped regions. Some closely related manufacturing industries will also be located in these areas. Because of the large scale and high cost, there will be considerable foreign investment and technology imported into these regions. This is an important window to attract foreign money and technology. In addition, some conventional industries will move inland because industries along the coast are too concentrated. I believe that this relocation is not to move outdated technology inland. Rather, newly constructed conventional industries will be distributed inland. It will require a great deal of imported technology and capital. This foreign technology and investment assisted move will involve the use of many advanced technologies for the first time in underdeveloped regions. We know that every profession has a technological leader. Technology transfer exists between departments and trades. It is not possible to create an abstract technology point. I think modern technology transfer has two special features:

First, technology transfer evolved according to existing productivity. A productivity evolved technology is closely related to the original industrial basis. Generally, processing industries, electronic industries and heavy product industries should be located near old industrial areas where the technical standards are relatively high. A major technology transfer requires considerable evolution.

Second, technology transfer aimed at surpassing the current production standard. This type of technology is primarily distributed in industries near the resources such as metallurgy, hydropower, large thermal power plant, coal, forestry and petroleum, construction materials and heavy machinery. The process from raw material to product is a weight reduction process which is affected by factors unrelated to productivity; such as resources and climate. Therefore, the major concern is the resources. Because all m ajor unexploited resources are in underdeveloped areas in China, technology transfer in these industries should aim at surpassing the current level.

Both techniques described above are not distinctly independent in practice. Instead, they are related and can be converted from one to the other under certain conditions. Although the nature of the transfer differs, yet they are essentially the same. Both transfer techniques obey the rule of saving time. They are two characters of the same thing expressed differently. The economic benefit of evolving certain technologies from existing capability is higher. In this case we should follow the time saving rule to develop the technology based on the current capability. However, certain technologies require breakthroughs in the transfer due to changes in the industrial distribution. This breakthrough will bring about higher rewards. Then, we should not transfer technology based on the less effective method. In a capitalist country, due to the constraint of the surplus value concept, technology transfer is carried out in many instances just to save some short term labor time. It is totally dictated by the surplus value concept. In a socialist country, technology transfer should save the working time of the entire society. Hence, certain modes of technology transfer in capitalist nations are not applicable in China.

Since the transfer of technology by gradient only reflects one specific feature of modern technology transfer, it is inappropriate to be singled out as a pattern. It is unable to objectively reflect the overall picture of technology within China, and is not consistent with the technology transfer characteristics in the world. I believe that essentially a technology transfer can be described as a "pattern which obeys the benefit" by comining the two features described above. (Several months ago I mentioned in some articles that technology transfer is constrained by the "law of demand and feasibility". This viewpoint was not profound and accurately expressed.) The law that technology transfer should obey the benefit indicates that modern technology transfer should focus on the optimal economic benefits of the entire society. The nature, direction and location of the transfer must follow this principle. Otherwise, a penalty should be imposed.

In practice, technology transfer can take place either by evolution from the present productivity level or by surpassing the current level. Both are independent, but connected. They can be converted in certain cases and form an inseparable entity. Hence, a series of mistakes can be made by ignoring the requirements from one side, or by overemphasizing the other. For this reason , I believe that the gradient technology transfer law is not valid. It is more appropriate to describe it as a system which obeys the economic benefit.

Discussion on Technology Transfer

Tianjin KEXUE YI KEXUE JISHU GUANLI [SCIENTILOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 12, 12 Dec 85 pp 22-24

[Article by Kang Rongping [1660 2837 1627] of Liaoning Institute of Sociology, Xie Yingzheng [6200 4975 2973] of the Northeast Institute of Engineering and Zhang Maodi [1728 3029 1717] of the Shenyang Institute of Firefighting Equipment: "Discussion on Gradient Transfer of Technology--Also Commenting on the Article 'New Technological Revolution and Basic Policy of Economically Underdeveloped Areas'"]

[Text] As we remember, the earliest paper on "Technology Transfer Within China" was published by Comrade He Zhongxiu in 1982. (1. See KEYAN GUANLI [SCIENTIFIC RESEARCH MANAGEMENT] 1983, 1). We also discussed the gradient and leap approaches in technology in papers such as "Law of Acceleration of Technology Transfer" (2. See QIAN KEXUE [POTENTIAL SCIENCE] 1984, 1 and SHIJIE JINGJI [WORLD ECONOMY], 1984, p 9). After reading the article "New Technological Revolution and Basic Policy of Underdeveloped Areas" (3. See KEXUE GUANLI YANJU [SCIENTIFIC MANAGEMENT RESEARCH] 1984, p 9) written by comrades from Inner Mongolia in June, we would like to express our views further.

I. Original and Modified Models of Gradient Technology Transfer

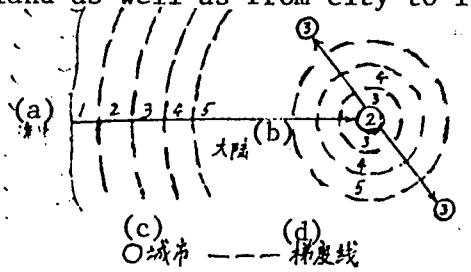
We believe that the gradient transfer of technology is to gradually transfer a technology according to a specific and uniform (geological space) gradient centered around its place of birth. In the real world, (large) cities are sources to spread technologies around according to some gradient. From the angle of human development history, there has been a (or few) leading nations in technology and culture in any historic era which acts as the source to gradually make the transfer according to a gradient.

In our society, "pure" gradient technology transfer only existed in ancient times.

In recent and modern times, the aforementioned gradient transfer has been modified because of the development of transportation on the sea. (1) A technology could be rapidly transferred to coastal areas in various continents by sea, which destroyed some of the original gradient. (2) It was then spread at a different gradient in a wide geological range according to the pattern from coastal area to mid inland area and to remote inland area.

(3) In this wide band gradient transfer process, radial transfer centered around (large) cities is also effective. Consequently, there are overlaps, causing some breakthroughs along the transfer route. For example, if a technology is transferred at a faster than average speed from the coast to an inland city and then transferred to its surrounding areas, it is possible for an inland city to receive a new technology before some areas closer to the coast--which creates some kind of a jump (see figure). We believe the gradient model presented by He Zhongxiu is (2) and (3), i.e. the gradient transfer from the coast to inland as well as from city to its surroundings.

a. Ocean
b. Land
c. City
d. Gradient line



The invention and development of various information transmission tools creates more and more significant interference and disturbance to the uniformity of the gradient in the technology transfer process. Rapid process in information transmission in the modern world causes many leaps in technology transfer, i.e. jumping over the original gradient to remote areas. Consequently, technology transfer becomes less and less limited by geological space. In this sense, we believe that the effective scope and range of the law of gradient transfer will shrink and eventually lose its significance in society.

II. Law of Social Development

Many comrades involved in research on scientiology originally studied the natural sciences. They cannot accept certain laws in the domain of sociology and scientiology. For this reason, we wish to discuss it in depth.

As compared to the laws of nature, the law of social development must have its own characteristics in addition to being objective, necessary and reproducible. The major ones include: (1) history. The law of nature must be valid over a long period of time. The majority of laws of social development, however, is effective only in a specific time period. They are replaced by new laws. The original laws become invalid due to new emerging economic conditions and are replaced by new ones. This was addressed by Stalin in his article "Economic Problems in the Soviet Socialism." (2) Trend and Approximation. Most of the economic and social laws are "a complicated and approximate form derived from continuous fluctuation" and a "dominant trend". They are an "expression of a interwoven trend" and "an approximation, a tendency and an average, but not a direct reality. The reason is partially because there are other laws in effect and partially due to their conceptual character". "Theoretically, we assume that the law of capitalist production is a pure expansion of the expression while in reality it is always an approximation".

If we recognize the scientific nature of the above theory, the law of technology transfer becomes much clearer. The law of gradient transfer was created and valid when transportation and telecommunications were not developed. Its original form only existed in the ancient society and it merely expresses a "dominant trend". As society develops and economic conditions change, the following factors affect the gradient transfer law: (1) means of information transfer, (2) means of transportation, (3) resources, (4) demands and (5) policies. Many variations are created. The interference due these factors also reflects that other laws are also in effect. One of the important ones may be called the law of technology transfer by breakthrough. It is created by the development of information transfer and capability to transport materials and energy. It may play an important role in the future, In theory, technology transfer may be divded into pure gradient, mixed and pure breakthrough types.

III. Four Modernizations and Technology Transfer

Some comrades from Inner Mongolia introduced different opinions in the article "Technology Transfer Within China". Many viewpoints are quite valid. For example, they suggested that serious studies should be conducted to come up with policies specific to underdeveloped areas in China. They also pointed out an important issue of the extent and scope of the effectiveness of technology transfer by gradient, i.e. the problem of different effects in differetn technology. In the past, we had considered agricultural technology. This time they mentioned coal and oil exploitation. We believe that technology transfer in the "first industry" which directly exploits natural resources (resource intensive) such as agriculture, forestry, fishery, mining (oil) and hydropower is indeed different from that of the "wecond industry" of manufacturing and processing. The former is less affected by the law of gradient transfer than the latter. We need to seriously investigate the uniqueness of the former.

We wish to point out here that the shortcomings of that article as well. First, it went to one extreme, attempting to deny the existence of the law of gradient transfer. We cannot agree with such statements as "It is not a rule to introduce technology and initiate development according to a three level gradient from the history and reality of economic development in the world". Second, it is inappropriate in the aspect of different treatment to international and domestic problems. Because the effectiveness of gradient and breakthrough transfer patterns is different, it is different in the international scene from the domestic picture. In many areas, it is not equivalent to the relation between developed and underdeveloped countries. Certain discoordinations can be adjusted by gradient transfer. We may be able to "unite the country" but we are not able to "unite the world". Although the new technological revolution offers an opportunity to underdeveloped nations to catch up, the adaptibility of this principle is different in the world from that within China. Third, it is a misconception to believe that the technological level of an area can be drastically improved by transferring "advanced technology" into its "first industry" regardless of its original foundation. They totally neglected that different foundation and digestion capability can lead to drastically different economic benefits.

We believe that technology is transferred in a mixed mode (we stressed the breakthrough mode in the "law of acceleration" article by treating it as a new trend). In developed countries, the breakthrough mode is more advantageouse, while in underdeveloped nations the gradient mode is more favorable. This is determined by a series of economic conditions. For example, someone compared the information exchange in China and Japan and found out that the information density in China is only 1/100 of that of Japan. Under this circumstance, as a socialist country, we should totally obey the law of gradient transfer. Economically, the development should focus on the approach from the coast to inland, from large cities to towns and villages. In recent years, many medium and small cities have become the stars in economic development. Isn't this a realization of technology transfer from large cities by gradient. It is no doubt a wise decision to open 14 more coastal cities following the special economic zone in Zhenzhen. This will accelerate the process of importing and transferring advanced foreign technology into various parts of China to speed up the four modernizations. Of course, there is no reason whatsoever to neglect the transfer of technology by breakthrough. However, it is not the focus of discussion in this article.

The views presented above may still be premature and mistaken. They were written for public discussion and criticism in order to aid the development of the theory and practice of technology transfer.

Manuscript written in May 1985, revised in August. (Editor in Charge Jin Zhong [6855 0022])

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CSO: 4008/224

NATIONAL DEVELOPMENTS

REGULATIONS ON TECHNOLOGY TRANSFERS

Hefei ANHUI RIBAO in Chinese 16 Jan 85 p 2

[Article: "Temporary Regulations on Technology Transfers Issued by the State Council (10 Jan 85)"]

[Text] In order to bring into further play the broad masses of staff and workers, especially the zeal, initiative and creativity of the scientific and technological experts, to apply rapidly the research results of science and technology and the specialized knowledge to the material production, to implement effectively the objectives of making the economic construction rely on science and technology and to aim science and technology at economic construction, the following regulations on technological transfers are hereby issued:

I. Technological Commodities and Technological Market

Under socialist commodity economic conditions, a technology is also a commodity. Units and individuals may all conduct technological transfers without local, organizational and economic forms of restrictions. The state has decided on the extensive opening of technological market and the flourishing technological trades in order to promote the advancement of production.

All technologies shall help to tap the new types of goods, to elevate product quality, to reduce production costs, to improve business management and to raise economic benefits. The seller and buyer can negotiate a uniform principle to conduct the transfers based on voluntary participation and mutual benefit. Those technology transfers which are contrary to the state laws and regulation policies should not be carried out. The transfers of those technologies which involve the national security or important economic benefits requiring secrecy should be processed in accordance with the related regulations.

II. Technology Transfer Fee

The technology transfer fee is the price of the commodity, adjusted by the market, and is negotiated by the two-party protocol. It may be calculated as a whole, or it may be based on increased sales volume or the fixed profit ratio after the implementation of that technology, or it may also be based on other calculation methods agreed on by the two parties.

The middlemen (including units and individuals) through whom the various aspects of the protocol of technology transfers are concluded and the technological commodities are traded may extract reasonable remuneration.

III. Technology Transfer Contracts

In technology transfers, the two parties should sign a technology transfer contract in accordance with the "Economic Contract Laws of the People's Republic of China" or other related legal regulations.

The two parties shall define the following items in the contract:

(1) whether the parties need to notify each other of the detailed contents of follow-up improvements in that technology;

(2) whether the transfer of that technology to a third party is permitted;

(3) the standard for delivery acceptance and its format; and

(4) whether prepayments of entry fees are required.

IV. Rights and Benefits of Technology Transfers

In carrying out the planning research of the state or higher level and in exploring the technology, besides extending the applications in accordance with the regulations of the plan, the responsible unit can also carry out transfers according to these regulations, and the income from this transfer can be returned to the unit. Those personnel who are directly involved in the research or in the exploration of that technology should be rewarded.

The awards made to the personnel who are directly involved in the research or the exploration of that technology should be based on the income from the transfer in the planning research and the technology of exploration. Those people who have taken the initiative in research on the market requirements, or those who have suggested the areas for exploration and have pursued them with zeal, should be given more generous rewards.

Those meritorious personnel who have assisted the receiving party in actually grasping the transfer of that technology should be given awards to those who are directly involved in research or to those who explore that technology.

The staff and workers who have finished their own work, and who work under the premise of not interfering with the unit's technological rights and benefits, may carry out research on their own and explore the technology, and the transfers will contribute to the staff and workers themselves or the task section. The material and equipment to be used in one's own unit in such an endeavor should be cleared beforehand with the unit, and usage fees should be paid.

In accepting commissioned research and technological explorations from other units, its rights and benefits should be handled according to the commission contract and these regulations.

V. Reimbursement of Technology Transfer Fees

The technology transfer fees of enterprise units under ownership by the whole people and collective ownership units are paid once. In the reimbursement of the management fees, if the amount is larger, it may be repaid in installments, scheduled according to the newly increased sales volume or profit, or reimbursed in installments according to the newly increased profit, before the tax and after the application of that technology. In the enterprise units under ownership by the whole people, the business expenses are reimbursed in installments from the surplus of a task or the income external to the budget; those having no task surplus or income outside of the budget for business expenses pay from the (general) business fee account.

VI. Taxation of Income from Technology Transfers

Units under ownership by the whole people and the collective ownership units which have a grand total net income under 100,000 RMB (renminbi) will be tax exempt, and the entire amount may be kept by the units. Those with a net income exceeding 100,000 RMB will be taxed for the excess according to income tax laws. The incomes from technology transfers of institutions of higher learning, scientific research units and other enterprise units under ownership by the whole people will be exempted from income taxes for 3 years, and the entirety can be kept by the units for developing scientific enterprises. The income from technology transfers by individuals will be subject to the personal income tax according to the tax laws.

VII. Uses of Incomes from Technology Transfers

The uses of incomes from technological transfers that are kept by a unit may be determined by the unit itself, and the leading body or other related departments should not transfer the funds or place a restriction on them.

The unit conducting technology transfers should extract 5-10 percent from the net income of the transactions which it keeps to be used as the award fees in accordance with Regulation IV. The task manager should preside over the distribution of such funds, and it is not to be interfered with by the unit or other related departments. This expense is not to be included in the total award fee of the unit.

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CSO: 4008/228

NATIONAL DEVELOPMENTS

PRC TO HOLD NATIONAL TECHNICAL FAIR 14 MAY-7 JUNE

OW252341 Beijing XINHUA in English 1448 GMT 25 Mar 85

[Text] Beijing, 25 Mar (XINHUA)--China will hold its first national technical fair at the Beijing exhibition hall from 14 May to 7 June, in a bid to spur its economic development with the latest technical know-how.

Addressing a press conference here today, Ji Yanshou, an official in charge of the preparations for the fair, said that it will serve as part of the breakthrough in the current reform of China's scientific research system.

According to Ji, the fair aims at closely linking academic research with economic development, and at making research results commercially viable as quickly as possible, as urged by the national science work conference earlier this month.

All state enterprises, collectives and individuals are welcome to visit the fair to seek or offer technical advice, contracts, training, technological transfer, information and products.

The sponsors plan to hold such fairs every year, and to invite business people from Hong Kong, Macao and foreign countries to the next fair, so as to give it a worldwide significance.

CSO: 4010/116

NATIONAL DEVELOPMENTS

FLOURISHING TECHNICAL MARKETS REPORTED

Beijing LIAOWANG [OUTLOOK WEEKLY] in Chinese No 4, 21 Jan 85 pp 32-33

[Article by Meng Xiangjie [1322 4382 2638]: "Technical Markets Are Flourishing; Bridges and Links--A General Survey of Technical Markets Nationwide"]

[Text] A new kind of trade market--the technical market--is springing up on Chinese soil. According to incomplete statistics from eight markets, Beijing, Wuhan, Shenyang, Dalian, Chongqing, Hangzhou, Xian and Chengdu, since 1981 a total of 31 large scientific and technical trade fairs have been held, a total of 19,000 scientific and technical achievements and technical service projects have been developed, 5,300 achievement sharing or technical cooperation contracts have been signed and the volume of business has reached 130 million yuan.

Since the 3d Plenum of the 11th CPC Central Committee, in the wake of both progress in restructuring the economic system and implementation of policies to stimulate the domestic economy and open China up to the outside world, scientific research departments and institutions of higher education in China are increasingly cognizant of the strategic importance of implementing the central authorities' policy that "economic construction must be based upon science and technology, and science and technology must be oriented toward economic construction." The crux of the matter is the question of how to transform the scientific and technical achievements we already have into productive forces, bring bridging and linking roles into play, orient scientific and technological work toward society and integrate science and technology with economic development. In this situation, the Shenyang Scientific and Technical Committee took the initiative in establishing a "Shenyang Scientific and Technological Services Corporation." Later, Wuhan, Beijing and other localities established similar organizations one after another. As of now, there are more than 1,100 scientific and technological development service organizations over localities and markets and there are more than 140 belonging to the various state ministries and commissions. In 1983 the "National Liaison Net for Scientific and Technological Service Cooperation Among Large and Medium

Cities" was also officially established with the support and guidance of the State Scientific Commission. The establishment of these organizations marked China's entrance into a new developmental period in the application and sharing of scientific and technological achievements, in the opening up of scientific and technological markets and in the training and interchange of skilled personnel.

Previously nobody placed sufficient emphasis on the spread and application of scientific and technological achievements in production. Now, scientific and technological achievements have moved into the economic and social domains in large volume and have thus produced enormous economic and social results. According to a Shenyang survey, the 1,500-plus projects for which scientific and technical contracts have already been completed have brought enterprise profits of more than 700 million yuan, saved more than 60 million yuan on the consumption of raw materials and energy, saved more than 5 million yuan in foreign exchange and brought new hope to 10 or 20 enterprises that have been operating at a loss for a long time. After the Beijing Center for the Interchange of Scientific and Technological Developments was set up in 1981, it brought the scientific and technological advantages of the Beijing area into full play. All sorts of technological forces were mobilized to develop scientific and technical undertakings, and institutions of higher education, research units, the relevant central government ministries and skilled technical and management personnel that were retiring or on leave were organized. Seven coordinative organizations, including the Beijing Corporation for Coordinated Scientific and Technical Development of Small Town Enterprises, the Beijing Navigation Science and Technology Development Corporation and the Beijing Center for the Development of Construction Technology were set up and four rather large-scale trade fairs were held to exchange technology and skilled personnel. Of these, the 4th trade fair, which was primarily intended to serve small town enterprises, brought more than 250 Beijing institutions of higher education and scientific research units into extensive contact with 10,000-plus small town enterprises. Contracts for more than 300 projects were established and these will have profound influences on the development of small town enterprises. In a period of something over a year, the Shanghai Center for the Exchange of Scientific and Technical Developments held eight fairs to exchange scientific and technical achievements in lasers, matrices, energy conservation and so forth. At the "Shanghai New Technology Trade Consultation Fair" alone, 684 agreements on technical cooperation, achievement sharing and advisory services were arrived at and the volume of business topped 18 million yuan. After these projects are realized they will produce notable social and economic results. For example, the "H-pattern special energy-saving fluorescent light" developed by Fudan University was shared with Shanghai's Lamp Bulb Plant No 3 and other units.

Based on the calculation of an annual output of 50 million fluorescent bulbs to replace incandescent bulbs, after operations are fully underway this may save 2.8 billion kilowatt-hours of electricity.

There are many forms through which scientific and technical achievements enter the marketplace: "science and technology trade fairs," "achievement popularization demonstration fairs," "coordinative scientific research and production organizations," "rural science and technology fairs" and so forth. Through these flexible and diverse organizational forms, technical consultations, technical services, plans and designs, patent transfers, public bidding to resolve difficult technical problems, supplies of samples and new products and other activities are launched extensively.

In developing lateral ties and bringing the superior aspects of composite multidisciplinary technologies into play, the scientific and technical markets have also played a role in the following areas: 1. They have promoted reforms in the scientific and technical system. Holding scientific and technical markets is in itself a kind of reform. In the wake of extensive development of this work, further assaults on the old management system will inevitably follow. After many localities have carried out successful scientific and technological transfers the scientific research personnel come to the forefront one after another. They have grasped production needs, which is helpful in problem selection and development, and they have simultaneously increased sources of income, improved scientific research conditions and brought vitality to the process. 2. They have promoted the transfer of military technology to civilian industries. The technological strengths of China's military sector are abundant, yet for a long time there has been little contact between this sector and the local economic sector. The technological service links have integrated military and civilian industries and directed them toward society. 3. They have brought the advantages of concentrated knowledge and skilled personnel available in institutions of higher education fully into play. Through their service to social and economic construction, institutions of higher education have promoted educational reforms in the institutions themselves and have accelerated the improvement of educational and scientific research levels. 4. They have spurred the integration of domestic development and introductions from abroad. 5. They have promoted the interchange and development of skilled personnel. In the wake of the extensive development of scientific and technical service work, the system of departmentalized ownership is inevitably breached. This promotes the reasonable flow of scientific and technical personnel from the cities to the countryside, from the large cities to medium-sized and small cities, from the interior to remote regions and from regions and sectors in which scientific and technological strengths are abundant to regions and sectors where they are weak and desparately needed.

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NATIONAL DEVELOPMENTS

PRC PATENT LAW GOES INTO EFFECT 1 APRIL

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[Text] Beijing, 1 Apr (XINHUA)--Chinese and foreign businesses filed about 4,000 applications with Chinese patent offices as the country's new patent law took effect today.

"The first day of registration has been very encouraging," said Huang Kunyi, director general of the patent office.

Of the 1,773 applications received by 3 o'clock this afternoon, about 80 percent were for new inventions. Another 16 percent were utility models and 4 percent new designs. Of the total, 842, or 47.5 percent, were from domestic inventors. The rest were filed by foreign applicants. The first application registered was from a research institute under the Ministry of Astronautics.

The biggest single contributor was Qinghua University, which applied for patents on 145 items.

Applications were also accepted by the Shanghai branch office and agencies of Shenyang, Changsha, and Jinan.

Sixty applications came from a subsidiary of the Phillips Company of the Netherlands, 30 from Takeda Chemical Industries Ltd. of Japan and 20 from the Bayer Company of Federal Germany.

Of the foreign applications, 40 percent involved the chemical industry and another 40 percent electronics. This indicated that foreign companies wanted to set up factories in China, according to Huang Kunyi. "Their enthusiasm shows that the Chinese technical market is attractive," he said. "We do not expect that all the applications will be first rate at the moment, and people may want to look and see. But experience will tell them that all their doubts and misgivings are entirely unfounded," Huang added.

About 4,000 patent agents have been trained, and patent agencies set up in most provinces, autonomous regions and municipalities. At the head office in Beijing, there are 207 patent examiners and an archive containing 30 million patent documents.

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NATIONAL DEVELOPMENTS

SOCIALIST PATENT LAW WITH CHINESE CHARACTERISTICS

Beijing RED FLAG in Chinese No 2, 16 Jan 85 pp 19-22

[Article by Gu Ming [7357 2494]]

[Text] The "Patent Law of the People's Republic of China" was deliberated on and adopted by the Fourth Session of the Standing Committee of the Sixth NPC. It was promulgated by the state president on 12 March 1984 and will come into effect on 1 April 1985. A socialist patent law with Chinese characteristics has come into being.

I

What actually are the Chinese characteristics which our patent law possesses? If we sum them up, they are as follows:

First, the law proceeds from China's actual conditions and mainly depends on our nation's vast number of technicians and masses of workers to invent and create. Our country has a vast area and huge natural resources and there is a definite base for industrial and agricultural production, and for science and technology. We have a population of 1 billion and along with this great population we have great amounts of talent and wisdom. We have a long history and cultural tradition and are at present carrying out the four modernizations. There are thus great prospects for invention and creation. The second article of the patent law stipulates: "In this law, 'inventions-creations' means inventions, utility models and designs." The patent law concurrently sets down three types of patents, which take into consideration China's national conditions and actual needs. Utility models and designs are minor inventions and creations and are important avenues for increasing varieties, designs, and types. They also have especially great significance in promoting the development of light industry, the textile and chemical industries, the daily-use products industry and the foodstuffs industry, and in satisfying the daily increasing needs of the people. Often utility models and designs are not paid much attention by people. Sometimes people rack their brains to create new designs or new patterns and then other people simply photograph them and produce copies. This is not rational and does not conform with socialist ethics. If we use a patent law to protect them this will encourage the vast numbers of technicians and the masses to strive to create new things and produce new products and new patterns so as to

enrich the markets and increase our export competitiveness. Our nation's patent law has taken the experience which has been accumulated on the international level over a long period in regard to the three types of patents and has stipulated this in a law. This is of benefit in fully bringing into play the masses' enthusiasm, in expanding and increasing technical innovation and in promoting the development of science and technology and the propagation and application of inventions and creations.

Second, it safeguards national interests and abides by international conventions. One of the major aims in establishing a patent system is to attract advanced foreign technology and to encourage foreigners to come and invest in our country. In order to encourage and attract foreigners to bring their inventions to China and apply for patents, our patent law stipulates that a foreign patent holder can enjoy patent rights in China in regard to those inventions-creations for which he has obtained patents in China. In order to protect our nation's sovereignty and interests, the patent law also stipulates that when a foreigner applies for a patent in China, the application will be handled in accordance with law, and in accordance with any agreement which has been signed between the country to which he belongs and China, or any international treaty to which both countries are party, or on the basis of the principle of reciprocity. It also stipulates that any foreigner who obtains a patent in China has the obligation to make the patented product or use the patented process in China, or otherwise to authorize other persons to do so. It is not permissible to replace production of the products in China by exports of the products to China.

Domestically, our patent law stipulates that for inventions or creations made by people while working in positions in units owned by the whole people, the patent right will be held by the unit. As for inventions and creations made by people while working in positions within units which are collectively owned, the patent right will be collectively owned. The patent right for other inventions and creations will be owned by the individuals. It also stipulates that no one can use a patent right without the authorization of the patent holder. After the patent holder's authorization has been obtained, it is permitted to draw up a written contract and carry out compensatory utilization. The stipulation in regard to inventions or creations made by people while in positions within units owned by the whole people is made because, while patents owned by the whole people are owned by the state, allowing the unit to hold the patent and carry out compensatory transfer allows the units to obtain benefits. This is of benefit in encouraging and motivating the enthusiasm of the units for invention and creation. On this point, the provisions of the law are different from the situation existing in capitalist countries and also from that existing in the Soviet Union and in some East European countries. In regard to the inventions by staff of capitalist enterprises, the patent right is owned by the capitalist. The Soviet Union and some East European countries stipulate that the state owns all patent rights and the inventor is only given an inventor's certificate.

Third, it is aimed at encouraging the advanced and spurring on the backward. Our nation's patent law also stipulates that the entity owning or holding the patent right shall award the inventor or creator in accordance with his contribution and based on the invention-creation's significance, the extent to which it is spread and applied, and the economic results yielded. This stipulation is intended to motivate the enthusiasm of the technicians and masses of workers in enterprises owned by the whole people or collectively owned. Regardless of whether it is technicians and the masses of workers of enterprises owned by the whole people, or those of collectively owned enterprises, all have advantageous conditions for being able to use their positions to invent things. However, some people invent and create while others do not. Some make great contributions while the contributions of others are small. These people should all be treated differently in accordance with their different situations. Those whose contribution is great should be rewarded greatly while those whose contribution is small should receive a small reward. Those who do not make any contribution should not be rewarded. This not only implements the principle of reward according to work, but is an incentive and a spur to the vast number of cadres, technicians, and workers.

Fourth, the state has the right to spread and apply inventions, according to law, so that they are of benefit to the people. In regard to any invention-creation which is in need of spreading and application or which is of great significance to the interests of the state or the public interest, regardless of whether the patent is held by a unit owned by the whole people, or is owned by a collectively owned unit or a Chinese citizen, the relevant departments of the State Council and the people's governments of provinces, autonomous regions, and directly administered cities, have the power to decide, in accordance with the state plan, that other units can use the patent and, after approval by the State Council at the solicitation of its relevant departments, can spread and apply the patents. The exploiting units shall pay, in accordance with the prescription of the state, a fee for exploitation to the unit or individual which holds or owns the patent right. In this way, the law reflects equally the rights of the state and of the people, and also takes into account the interests of the units, collectives, and individuals.

II

Why must our country establish a patent system, and promulgate and implement a patent law?

The parent system was established by the Western bourgeoisie and was the product of a commodity economy which was highly developed and has reached a certain stage. Marx and Engels in the "Manifesto of the Communist Party" said: "The bourgeoisie has stripped of its halo every occupation hitherto honored and looked up to with reverent awe. It has converted the physician, the lawyer, the priest, the poet, and the man of science into its paid wage-laborers." Of course, engineers and inventors were not excluded. The bourgeoisie took the results of mental labor--scientific and technical inventions and creations--and made them commodities, to be freely traded

like other commodities. In trade competition between capitalists new discoveries were a powerful competitive measure. The application of new technology allowed capitalist enterprises to reduce their costs, raise quality, expand sales avenues, defeat opponents and achieve super-profits. They were a money-spinner for the bourgeoisie. Competition between capitalist enterprises put forward an intense demand that they do their best to monopolize the rights to new technical inventions. This then is the history of the production of patent systems in the West. When the patent system had just been established, there was only registration and there was no investigation of the essentials. To guard against indiscriminate use of patent rights, from the 1830's the U.S., German, and English patent laws successively stipulated systems for examining whether components were new and original. By the beginning of the 20th century, most of the industrially developed countries had adopted these examination systems. In 1883, the "Paris Treaty on Protecting Industrial Proper Rights" was concluded. In 1970, the International Intellectual Property Rights Organization was set up. Today, 158 of the world's countries and regions have already promulgated and implemented patent laws.

Our nation is a socialist one where the means of production are under public ownership. The main reasons we must promulgate and implement a patent law are as follows:

First, in a socialist society, on the basis of socialist public ownership, there still exists commodity production and commodity exchange. Scientific and technical inventions and creations--intellectual achievements--are also special sorts of commodities.

Second, the protection of invention-creation patent rights, regardless of whether they are of inventions by staff of units owned by the whole people or collectively owned units, or of inventions by individuals, the implementation of material rewards and the permitting of compensatory transfer are all of benefit in better implementing the economic and technical responsibility systems, in opposing egalitarianism, in smashing "the big pot" and in implementing the principle of reward in accordance with work. A socialist society has no exploitative systems and thus the amounts paid as rewards in guarding inventions and creations cannot become capital, much less give rise to capitalism. This is the basic difference between a socialist patent law and a capitalist patent law.

Third, the system of patents has been universally accepted throughout the countries of the world. Since we implemented the policy of opening to the outside world, we have established and developed economic and trade relations with over 160 countries and regions. If we wish to participate in international trade, we must abide by the necessary common rules. If one wishes to attract advanced foreign technology but does not have a patent law, the foreign patent owners will not be at ease. They will be afraid that you will arbitrarily transfer, copy, and infringe upon the advanced and important patents. Thus, they will not supply you with the technology. Therefore, if patent rights are not guaranteed, it will not be beneficial to implementing the policy of opening to the outside world.

Fourth, we already participate in the World Intellectual Property Organization. If we do not establish a patent system, it will not be beneficial to stabilizing our country's position and role in this international organization. Participation in this international organization and having an understanding of the situation in regard to the tremendous number of patents and inventions in the world, is extremely necessary for the further development of our nation's science and technology.

Fifth, our nation's inventions and creations which have been made on the basis of self-reliance urgently require the protection of the state. At present, our country is carrying out the four modernizations on a large scale. In the practice of construction, it is necessary to bring talented people forward in large numbers, and to have technical inventions and creations made on a continuing basis. Our nation has already made some scientific and technical inventions and creations which have been recognized throughout the world, and for these we have obtained foreign patent rights. We must in a timely way protect our own patents so that we can carry out technical exchange on the basis of equality between nations.

Sixth, modern science and technology can no longer be monopolized by a few advanced countries, and is increasingly becoming wealth commonly created by many countries. In the last 200 years over 26.5 million patents have become invalid. Those patents still in force number 3.5 million and every year there are about 500,000 patents for new discoveries. If we wish to achieve the four modernizations, we must gear ourselves toward the mighty torrent of inventions and creations in the world. We should pay attention to the scientific and technical achievements and, through the implementation of patents, allow our nation to utilize and spread these achievements.

III

If we are to establish a new situation of socialist modernization, we must have the world in view and must sum up the experiences of the world's countries and of our own country in using patented technology.

In the last 200 years, the various countries of the world, in using patented technology, have obtained great experience in emulation and competition and in success and failure. For example, Germany, France and the United States once lagged behind England. It will be greatly beneficial to our country to seriously study the experiences of the countries of the world in using and attracting advanced technology and in speeding the realization of national economic modernization. It is especially important for us to study and sum up Japan's rapid modernization through the use and importation of advanced technology since the war, and their success in overtaking the world's advanced levels. Japan's economy suffered serious setbacks during World War II. After the war, the technology in Japan's industrial sector was very outmoded. Its technology was about 20 to 30 years behind that of the United States. Postwar Japan thus began to import technology and in the 28 years from 1950 to 1978, it imported 29,599 items of new foreign technology, for which it paid $7.66 billion in foreign exchange. For imported technology and complete sets of equipment, it paid over $10 billion

in foreign exchange. Domestically, about $30 billion was paid in spreading and studying the imported technology. In addition, Japan organized 2,000 joint ventures with the United States and through these joint ventures imported the newest technology which it could not obtain through normal channels. If we analyze this further, the results of Japan's use of patented technology can be seen more clearly. From 1955 to the end of the 1960's, 13,229 patent licenses were purchased at a cost of $2.15 billion. A total of $6 billion was spent on spreading and researching this technology. However, foreign countries at this time spent directly and indirectly an estimated $180 billion to $200 billion on scientific research and design for these patented inventions. In these 15 years, 32 percent of the growth in industrial output value came from imported technology, and this portion of the output value was 10 times the amount expended on importing technology. More important was that Japan, through the import of technology, mastered nearly all of the new technology invented throughout the world in the previous 50 years. This resulted in Japan gaining about 30 years of progress. Since the war, Japan, through importing patented technology, digesting and improving it and adding its own inventions and creations, has cast off its unfavorable situation of the postwar period when technology was backward and the economy poor. By the end of the 1970's, it had leaped forward to become an economically and technologically great country and in many aspects, it had caught up with or surpassed the United States and the Federal Republic of Germany, which were the world's most technically advanced nations. We cannot say that Japan's success was entirely based on imported technology. There were other beneficial conditions both domestically and internationally. However, importing technology was a major facet of the success, and it is this factor which is capable of reducing the differences between the technologically and economically backward nations and the advanced nations. Today, regardless of whether we speak of our political, economic, scientific and technical, natural resources or international conditions, we are in a much better position than Japan was after the war. However, we must recognize the differences, like the present advantageous conditions of the new technical revolution, and better link up self-reliance with importing advanced technology. By these means, we must strive by the end of this century, to achieve parity or to surpass the advanced world standards in conventional technology and in several aspects of sophisticated technology. This is an important strategic task.

During the "Cultural Revolution," the "gang of four" engaged in a vigorous policy of closing the country to international intercourse, and slandered the importation of technology as a "slave comprador philosophy" and "national betrayal." Jiang Qing concocted the "escargot incident" to oppose the project to import color kinescopes. She forced the leading comrades and technicians of the relevant departments to "guarantee that within 3 years we could build and produce color kinescopes and color televisions." This resulted in great amounts of national funds being wasted, and the waste of a lot of time. After the "gang of four" was overthrown we again imported technology and then produced color televisions of an internationally advanced standard.

In the last 30 years, we have not paid sufficient attention to patented technology and have thus spent large amounts of foreign exchange on buying foreign products. For example, we have spent several billion dollars in buying large numbers of vehicles. But even now, we are still unable to produce Chinese sedans or large-tonnage heavy-duty vehicles which meet international standards. If we purchased the patented technology, within 2 or 3 years, or 4 or 5 years at the most, we would be able to produce products of a relatively advanced standard. Also, in the past, our nation imported many complete sets of equipment, but we did not pay attention to purchasing patent licenses. According to our experience, using advanced technology to produce these complete sets of equipment would have been one-half or two-thirds cheaper than the cost of importing them.

As a technologically backward country, it is rational for us to import some necessary sets of equipment. The "156 sets" of complete equipment which our nation imported in the 1950's played an important role in economic construction. In the middle of the 1970's, in compliance with Premier Zhou Enlai's directive and with the State Council's approval, we formulated a "$4.3 billion importation program." Complete sets of equipment imported included 13 sets of equipment each capable of producing 300,000 tons of synthetic ammonia. They have since produced tens of millions of tons or urea. At the same time, we imported a set of chemical fiber and plastics equipment, increasing our capacity to produce chemical fiber and plastics by over a million tons. This was greatly effective in laying a base for our country in the petrochemical industry. However, following the establishment and progress of our nation's industrial, and scientific and technological base we must change from importing complete sets of equipment to purchasing patents and blueprints, and produce the equipment and products ourselves. In striving to make up time, under the precondition of raising economic results, it is permissible to import a certain number of necessary, complete sets of equipment while also purchasing patents.

We often say, "What other countries have, we need, and what other countries lack we need also." This is entirely correct. The crux of the problem lies in taking advantage of the current fine international and domestic situation and striving to make up time in achieving the four modernizations, increasing our nation's defense strength and economic strength and satisfying the people's material and cultural needs. Our aim in promulgating and implementing the patent law is first to encourage self-reliance among our 1 billion people so that they will set to work to invent and create. However, at the same time, it is also beneficial to the import of advanced foreign technology, to the development of foreign technological interflow, and in the promotion of self-reliance. For our socialist nation, self-reliance is a long-term principle. We can never be subject to the "bestowing of charity" by other countries. Thus, in building the four modernizations, we can only rely on our own strengths and act according to our own capabilities. However, self-reliance certainly does not mean closing the country to international intercourse. Looking back to the past, in the 1950's we put forward the slogan of "small, indigenous, and of a mass nature," and organized on a large scall small iron and steel operations, and small chemical and industrial operations. We paid out large

amounts and followed a winding path. All of these actions were divorced from technical progress, were not concerned with economic results, and were carried out rashly in accordance with "human sea military tactics." This sort of action can only hinder self-reliance, not promote it, and is unable to achieve the four modernizations. Thus, we must use the present beneficial international and domestic situation, and actively encourage the people of our nation to invent and create. We must also actively use and import foreign funds, advanced patented technology, and advanced management experiences, and learn how to combine these with original creation. If we combine the purchase of patented technology with the tackling of key problems, we will be able to make up time, promote self-reliance and work hard to catch up with and surpass the world's advanced levels.

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FOSTER NEW IDEAS IN FACE OF NEW TECHNOLOGICAL REVOLUTION

Beijing RED FLAG in Chinese No 2, 16 Jan 85 pp 28-31

[Article by Chen Liangjin [7115 5328 3866]]

[Text] The new technological revolution that is rising in the world today will be of great significance which will surely reach far beyond the domain of technology. It will have influence on the productive setup, economic structure, social life, and many other fields. These are the complex and chain effects of the technological revolution. If we say all the previous technological revolutions were mainly the extension of the physical power of mankind, then the present technological revolution can be regarded as an expansion of human intelligence. This is an opportunity which a developing country like China must not miss.

We have missed several opportunities in history. In the mid-18th century when the Industrial Revolution was emerging in Europe, China was enjoying the so-called "flourishing age of Emperor Qian Long." Being a closed and ill-informed society, China failed to make any response to the technological revolution then rising in the world and thus lagged further behind the world's advanced level. The Western colonialists began to threaten the east in the mid-19th century and pitted guns and cannons against broadswords and spears. Japan seized this opportunity, launched the Meiji Restoration and achieved success. China for its part initiated the "Westernization Movement" and later the "Reform Movement of 1898" which was bloodily put down by the conservative faction only 106 days after it was started. After the founding of the PRC, the Chinese people have striven hard to get rid of poverty and backwardness and to catch up with the advanced economic and technological level of the world and have made great achievements. However, in the mid-1960's and in the 1970's when a worldwide new technological revolution was emerging, our country was suffering from the 10-year internal disorder of the "Great Cultural Revolution." As the principle of "taking class struggle as the key link" was preached every day, we again missed the opportunity and lagged even further behind others. Now comes another opportunity. We must make sure that this opportunity will not be missed. As each opportunity only lasts a while, we must make the best use of our time to take up the challenge.

What change should we introduce in our mental orientation in order to grasp the opportunity and take up the challenge presented by this new technological revolution currently emerging in the world? In light of the present circumstances, we should pay attention to the following aspects.

First, we must change our frame of reference and broaden our outlook. We have isolated ourselves from the world for many years and know little about the development in the world in the past few decades. We were really shocked by the tremendous changes which had taken place in the world over these years when we resumed contact with the outside world in implementing the open-door polity. The worldwide new technological revolution and the rapid development trend arising from it have brought about a change in the frame of reference with respect to people's mental orientation. Such a change shows itself in two ways:

1. We used to pay sole attention to vertical comparison. But now we have begun to attach importance to horizontal comparison and combined the two ways to form a coordinated whole. In the past, we limited our frame of reference to ourselves, comparing what we are today with what we were yesterday and the day before yesterday. Thus, we only saw our achievements and development instead of the gap between our achievements and the advanced level of the world. However, if we take the advanced level of the world as our frame of reference, we will be able to find out our weaknesses and thus do all we can to catch up. The concept of modernization is not only a historical concept but also a worldwide concept. According to its original meaning, modernization is a concept on developing horizontal comparison. Implementation of the open-door policy provides us with a frame of reference in modernization. It is really important. Horizontal comparison should inspire us instead of frustrating us. Technically speaking, by "aiming high" we may be "well up to the average." Anyway, this will be much better than what we can achieve if we "aim low," being content with the existing state of affairs and being unrealistically optimistic. Setting up a new frame of reference, discovering the exact position of existing things by their coordinates, thus formulating the development strategy for the future and drawing up the necessary measures, is a necessary process for us in getting closer and closer to, and finally catching up with or even surpassing the advanced level of the world.

2. We used to adopt the closed-door policy but now we have turned to implementing the open-door policy, extended our field of vision to the world, and made comprehensive observation and analysis. This is a change in our space concept. The very purpose of the open-door policy put forth by the central authorities is to put an end to the country's long-standing closed-door policy. The closed-door policy was an expression of feudalism. And long-standing closure has resulted in backwardness, a closed "character," closed "habits," and closed "concepts." Like Madame Nine Jin in Lu Xun's novel "Disturbances," people who are used to the closed-door policy always feel "uncomfortable" with new situations and new events. The implementation of the open-door policy has first of all provided us with a frame of reference enabling us to correctly evaluate our position in the vast world and to emancipate ourselves from old concepts. Only by doing so can we join the

worldwide competition and absorb the advanced technical know-how of the contemporary world and the experience in operation of modern large-scale production. This is a necessary condition for us to embrace the new technological revolution and share the great achievements resulting from new technology. A leader must be equipped with a "universal antenna" which can "scan" through a full 360 degrees. His eyes must be "bifocal" to enable him to watch with a telescope the domestic and international situation and its development trend, and to observe with a microscope the internal circumstances in his own departments, so that he can make decisions in a scientific way to cope with every complicated situation.

Second, the time-efficiency concept. To many comrades returning from abroad it seemed that they had suddenly changed to watching a slow-motion movie as soon as the airplane landed--both the motion of people and machines and the way of thinking seemed to have been slowed down. This is a difference in the sense of time due to displacement in space. Nowadays there is a view holding that space is being constantly "devalued" while time is being "appreciated" since modern means of transport have shrunk the earth so much that any point on it can be reached from any other point within 24 hours.

The Shekou industrial zone put forth a resounding slogan: "Time is money and efficiency is life." Opinions on this slogan were varied at the beginning. Comrade Deng Xiaoping endorsed this slogan when he inspected Shenzhen. According to Marxist points of view, given the conditions of the commodity economy, the value of a commodity reflects the amount of human labor embodied in the commodity and is determined by the amount of the necessary social labor time consumed in the production of the commodity. If a producer (enterprise) manages to use less labor time than the necessary social labor time in producing a commodity of the same category, it means that this producer can make more money than average social producers (enterprises) do in an equal amount of time. For this reason, Marx summarized all kinds of economizing as a saving of labor time and all wasteful practices as a waste of labor time. The statement that "efficiency is life" is an expression of the very basic principle of Marxist economics that labor productivity is directly proportional to the amount of the commodity's utility and inversely proportional to the commodity's value. Thus it can be seen that this slogan is not only above criticism but also worthy of being emulated by all trades.

As a kind of resource which cannot be reproduced, time cannot be stored or regained, therefore is the most precious resource. In some economically and technologically developed countries, even the time spent in holding meetings is counted as part of production cost. For example, a Japanese industrial company has set a formula: cost of meeting equals 2ABT, where A denotes 3 times the average per-hour salary of the staff; 2 is a constant implying that as some staff members are participating in the meeting, regular operation is interrupted, thus the loss caused thereby must be counted; B denotes the number of persons participating in the meeting; and T the duration of the meeting. However, in our country, we have never counted time as part of production cost. The ignorance of the value of time has undoubtedly brought about tremendous losses in both material and spiritual production.

Third, the concept of information. Information is an important resource. All trades must have information. A decisionmaker has to make his decision based on information, and the amount of information available to him and whether he can obtain accurate and complete information in good time is a key factor in the validity of the decision. People engaging in scientific research also have to attach inportance to intelligence and information. It would be very wasteful if a scientific researcher knew nothing about scientific achievements made and problems solved abroad but continued to spend his time on those second-rate duplicated basic research projects already solved by others. To secure sufficient information is a basic condition for successful scientific research.

A "pioneering" cadre must have a wide coverage of information, a sharp capacity for reaction, accurate judgment, and quick adaptability. Some Japanese have compared the ability of collecting intelligence to the "legs of an ostrich" which take every step steadily; and the sense of intelligence to the "wings of an eagle" which enable it so soar in the immense sky and bring it into a completely new space instantly.

Fourth, the concept of talent. If information can be regarded as a kind of resource, then talent should be part of capital. There may be incompetent leaders, but there are no useless talented people. The competition in modernization is in substance a competition in terms of science, technology, and management, which in its turn can be summarized as a competition for talented people. A smart leader must "be fond of talent, have a sharp eye to discover talent, be magnanimous to talent, and be duty-bound to the fostering of talent."

It is just unimaginable that a person can solve on his own the complicated and comprehensive problems in modernization construction. Therefore, a leader must rely on his "brain trust" and the collective wisdom of talented people. In his prize-winning thesis, "Investment in Manpower Capital," Theodore W. Schultz, an American Nobel Prize winner, said: "Investment in personnel training has always been overlooked in developing countries. The leaders and executives of these countries hold that material investment alone is the important element in economic development, and large-sized steel works the symbol of industrialization. Given the shortage of funds, they just borrow foreign loans to buy equipment and build plants and warehouses. To be sure, they have imported a lot of modern equipment. But without qualified personnel to operate all this equipment, production efficiency remains very low. As the development speed of manpower has filed to keep up with the growth in capital, they are faced with a bottleneck in economic development." Without qualified personnel, funds and equipment will remain idle and useless. Talented people are the most important assets among all other things. Carnegie, the first "steel magnate" in American history, declared: "You can take away all my plant, equipment, market, and capital, leaving me my organization and talent. I will be steel magnate again within a few years."

The Chinese nation has the tradition of cherishing talented people. For example, the stories of "Xiao He who pursued Han Xin on a moonlit night to

invite him to return to serve as a chief commander" and that of Liu Bei who "visited Zhuge Liang in his cottage thrice to invite him to be his adviser," have been passed on with approval. Even Xiao He and Liu Bei as feudal politicians could be courteous to the wise and condescending to the scholarly. We communists should naturally seek talented people with eagerness. Comrade Deng Xiaoping said: "Empty talk cannot help to realize modernization. We need knowledge and talent. How can we make progress without knowledge and talent?" It is a pity that many people still fail to understand this truth so far. I am afraid that we still have to go a long way and wage necessary struggle to bring an end to cases of persecuting talented people as illustrated in the story "Tears of the Diversiform-leaved Poplar." It is necessary to foster in our society a concept, an atmosphere, and a habit of making people cherish, respect, be eager to discover, to make proper use of, and to train talented people. Our leaders should take the lead in doing so.

The necessity of giving full play to the strong points of talented people is the kernel of the concept for modern leaders to make proper use of talent. In his book "The Efficient Administrator," the well-known management expert (Dulager) [2629 2139 0344] said: "If you want your employees to be free of shortcomings, then your staff will be at most a mean one. If you want 'everything to be all right,' the result will just turn out to be contrary to your expectations. The more talented a person is, the more obvious his shortcomings will be. A high peak is always accompanied by a deep valley. Nobody can be perfectly versatile. When compared with the enormous sum of knowledge, experience, and capability so far accumulated by the human race, any great talent will turn out to be unqualified." "An administrator will be weak if he is blind to others' strong points but sees only their weaknesses, and does nothing to bring their strong points into full play but always exaggerates their shortcomings."

The crux to employment of talented people lies in the ability of a leader to know his subordinates well and to assign them jobs commensurate with their abilities. In summing up the reasons why he managed to defeat Xiang Yu and thus unify the country, Liu Bang said: "First, I am inferior to Zifang in respect of the ability of devision strategies and exercising remote control over troops thousands of li away to assure victory on the battlefield; second, I am inferior to Xiao He in respect of managing the state, governing the people, and securing provisions for the army; and third, I am inferior to Han Xin in commanding hundreds of thousands of troops to conquer all enemies. All three are outstanding personalities. The reason I was able to seize the state power was that I placed them in the appropriate positions in my service. Xiang Yu failed to make good use of Fan Zeng. That was why he was defeated by me." It is impossible for a leader to be superior to others in every field. But he must possess a superb ability in employing talent. The principle of "no talented people staying idle outside the imperial court" was taken as a criterion for good politics in ancient China. If a talent of virtue is employed, a great many talented people will be attracted and come over. However, if a wicked person is employed, many talented people will quit."

It is by no means easy to make use of talent. But it is even more difficult to protect talent. Talented people are always different from ordinary people. And as the sayings go: "Gossip is a fearful thing," "outstanding performance arouses jealousy," and "heroic deeds are the origin of persecution," talented people may easily become the target of calumnies as soon as they show their outstanding abilities. Old traditional thinking states that "a bird which sticks its head out will be the first to be shot," and that "the most well-known person will be the first to get trouble and the plumpest pig will be the first to be slaughtered." Such ideas still have influence among people today. Not all people cherish talent but many people are jealous of talent. To protect talented people one needs courage and will-power, just like Chen Xiuyun, who "was brave in recommending and protecting talented people." In face of slanders on talented people, a leader with courage and insight must step out to refute all attacks on them, to protect them, and to "express appreciation of their abilities so as to encourage them to give full play to their initiative."

The key to the creation of a new situation at present is to boldly select and promote those talented people who are brave in launching reform and blazing new trails. It should be noted that some comrades who have vigorously advocated the enforced reform have been attacked and suppressed in certain places and units and have been prevented from entering leading bodies. Some comrades are still upholding some outmoded concepts, preferring those who are lacking in initiative, overcautious, and of limited ability, but regarding as "incautious" and "unreliable" those who are strong in party spirit, well-trained, and brave in blazing new trails. It is true that prejudice makes one deviate further from truth than ignorance does.

How should we interpret the revolutionization of cadres? Revolution means to emancipate productive forces and the development of productive forces is our most fundamental task at the socialist stage. The very purpose of reform is to develop productive forces and to improve the people's material and cultural life. Therefore, a more important requirement for cadres in respect of revolutionization is that they must be determined to devote themselves to reform. Of course this is not all the content of revolutionization. But loss of determination in reform means loss of the kernel of revolutionization.

Fifth, the concept of system. Modernization is a tremendous systems engineering project. Systems engineering is a branch of technology concerned with management and leadership which has been developing along with the new technological revolution. The decisionmaker in modern times must not only adopt the concept of system but also make use of this branch of technology. System means the organic entity composed of various elements linked together according to a fixed order. Everything in the world is a system in itself, it integrates with other things to form one enormous system.

The modern economy is a multi-dimensional network-type system with multiple variables, multiple levels, and multiple elements interweaving together and

having a complicated cross effect on each other. Viewed from its vertical structure, the modern economy comprises market forecast, scientific research, technological development, product development, plant operation, storage and transportation, circulation and marketing, market service, and so on. All these links are related to each other, condition each other and form a fro--market-to-market economic cycle. The intereffect between various links and elements makes the system work and the malfunction of any link will affect the highly efficient operation of the big system. For example, a certain enterprise has raised its output by 5-10 percent but suffered a 30-percent loss due to obstruction in transportation or damages resulting from careless cargo handling. Thus this enterprise has achieved virtually no economic results. As the proverb goes: "The strength of a chain is not determined by its strongest link but its weakest link." Even if the strongest link of a chain is as strong as diamond, the strength of this chain may be rendered as weak as bean curd as long as its weakest link is as weak as bean curd. We have a "wooden tub theory" respecting the process of decisionmaking in management which states that if a wooden tub is made of wood strips of different length, then the volume of the tub will be determined neither by the length of the longest strip nor the average length of all the strips but by the length of the shortest one. In order to increase the volume of the wooden tub, it is necessary to extend the shortest strip. This is the kernel of the concept of viewing the system as a whole.

Viewed from the horizontal structure, the modern economy contains more than just two things--production and marketing. It has to coordinate with ecology, environment, population, and many aspects of social development. We cannot solve the problem in an isolated way, aiming at a single target and concentrating our attention on a sole factor, but must set up a whole system of development goals so as to ensure that science and technology, the economy, and society are developing harmoniously. Any field in connection with which we must make decisions should be considered as a system. With the overall goal as the key link, all subsidiary goals must be subordinated to the overall goal. It is also necessary to emphasize the coordination between various subsidiary systems so as to give full play to the cross effect between different goals. Furthermore, it is necessary to evaluate the role and performance of each subsidiary system within the whole system so as to maintain a dynamic balance between different levels and to produce the maximum all-round capacity.

Based on the concepts of systems engineering, the purpose of the reform of the economic structure currently being carried out in our country is to rationalize the management structure, the economic structure, the structure of regulative mechanism, and the structures of other economic levers, links, and levels with the general aim of raising the overall efficiency of the whole system and accelerating the development of productive forces. To fulfill this aim, it is necessary to set up professional system analysis departments and a network of automatic information system and to reconstruct a live and dynamic image of each system based on the respective data stored in the memory of the computer. All these are modern technical means necessary to highly efficient operation, commanding, coordination, and control.

To fulfill the needs of the times--creating a new situation in socialist modernization and keeping up with the historical trend emerging after the initiating of the reform and the implementation of the open-door policy--our cadres are required to be pioneers. Comrade Deng Xiaoping said: "Both revolution and construction need a group of pathbreakers who are brave in thinking, making attempts, and blazing new trails." Our pioneering cadres should be such pathbreakers. We also need executive cadres. But execution calls for initiative too. A cadre who merely plays the role of "dispatcher" and "parrot" is not a real executive--he is in fact going slow in his post. People used to hold that maintaining what has been achieved by one's predecessors is even more difficult than starting a new undertaking. However, this old concept is no longer valid nowadays. Just remember that it is impossible to keep the heritage left over by our predecessors, the only way out is to constantly blaze new trails.

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NATIONAL DEVELOPMENTS

DIALOGUE ON INTEGRATION OF NATURAL, SOCIAL SCIENCES

Beijing LIAOWANG [OUTLOOK WEEKLY] in Chinese No 2, 7 Jan 85 pp 22-23

[Text] Editor's note: Applying mathmatical models in economic research is a new attempt to integrate the natural and social sciences. This conversation between two scientists, renowned in their separate fields, was accidential. Nevertheless, the issues they covered are inevitable--the developing trend of modern science and technology toward becoming highly diversified and highly integrated results in the continuing intensification of the penetration and fusion between the natural and social sciences. The concepts and methodologies of natural sciences have gradually penetrated the social sciences and have become important methods in social science studies. The research results of social sciences have also exerted more and more influence on the development of natural sciences. Therefore, no single discipline alone can solve the complicated problems brought forth by modern society. Under these circumstances, the dialogue between natural and social sciences is a historical certainty.

We are expecting frequent and effective "collisions" between the two major sciences. We believe that this kind of "collision" will generate unimaginable and enormous creative power.

Not long ago, an important conference was held in Beijing. During recess, two famous scientists, who are also old friends--Xui Muqiao [5641 2550 2890] of economics and Qian Xuesen [6929 1331 2773] of natural sciences, met unexpectedly. They sat down together and carried on a meaningful and profound conversation.

Xue Muqiao: How to apply the knowledge of natural sciences more effectively to serve social sciences, in particular economic development, is an important question. With the development of social productivity, the reciprocal penetration among disciplines becomes increasingly important. For example, the

problem of how to apply systems engineering to economic studies to obtain valueable practical results is worth investigating. You are an expert in the area of systems engineering.

Qian Xuesen: I am no expert on systems engineering. The Institute of Econometrics and Technological Economics, Chinese Academy of Social Sciences, is studying this subject. Comrade Wu Jia-pei [2527 1367 1014] of the Institue began studying this problem in the early 1960's. Western nations began to apply mathematical methods to analyze macroeconomics and microeconomics earlier. Not long ago, the Information Control Institute of the Ministry of Aviation Industry, a technical engineering unit originally specialized in automatic control area, was commissioned by the Economic System Restructuring Commission of the State Council to construct an economic model that can, by mathematical quantitative analysis, adjust the prices of oil and grain as well as wages to solve the problem of financial subsidy. These scientific and technical personnel trained in natural sciences naturally have no idea of economics. Therefore, in the process of constructing a model several economists were invited to lecture on some special topics in economics, and a large amount of data and information were collected from appropriate economic departments. This model contains several hundred variables and several hundred equations. By calculating with a computer with the speed of a million operations per second, the results show that: so long as the annual rate of increase of agricultural development reaches 6 percent, light industry reaches 7 percent and heavy industry reached 8 percent, price adjustments would enhance economic development and increase revenue but would not cause economic chaos and lower the living standard. Some economists believe that this model can be very helpful in macroeconomic decision making on the national economy. This is a more successful case of applying natural sciences to economics. I suggest that attempts continue to be made in this area. Economists, based on their experiences, provide economic projects and explain the internal connection and developmental trend of economic phenomena. Natural scientists and experts in the systems engineering help economists carry out quantitative analysis. On this apsect, merely relying on the efforts of one side is like "clappingwith one hand".

Xue Muqiao: It is extremely necessary to employ econometrics and computers to carry out economic analysis. But, for the moment, two major difficulties have to be dealt with first. First, because economic activities are extremely complicated, the making of an economic decision is often constrained by factors from many areas such as politics, economics, etc, including some that cannot be quantitatively analyzed. This brings a substantial degree of difficulty in constructing a scientific economic model. Second, a substantial portion of economic statistical data that we have are not accurate enough, especially those from some historical periods. They have been influenced to a greater extent by politics or other special situations and cannot accurately reflect the regularity of economic development. Comrade Hua Luogeng [5478 5012 1649] says that computers are not lie detectors. With unreliable input, the output data cannot be trusted and thus has no practical value. However, this is not to say that computers cannot be used

in economics. This is to say that economic management departments shall strengthen their work on measurement and calculation of statistical data in order to be as accurate and complete as possible so that a regular correlation can be found. Of course, there is a direct correlation between regularity of data and stability of economic development. We have to arrange a large group of economic management personnel to learn econometrics and computer technology. We also can train from among engineering students a group of economics experts to perform quantitative analysis.

Qian Xuesen: Some engineering schools in China, such as Qinghua University, Tianjin University, Shanghai Jiaotong University, Shanghai Mechanical College, Central China Engineering College, and Xi'an Jiaotong University, offer systems engineering as a special field of study. Personnel trained in systems engineering can find projects from economic departments, do research and boldly apply information theory, control theory and systems engineering to economics. Economic departments also have to take the initiative to provide projects.

Xue Muqiao: Before the "cultural revolution", departments studying economic theories and those doing practical work were isolated. Now, the Economic Research Center of the State Council is able to interconnect departments doing social science research and those doing actual business. But it has not done a better job in interconnecting natural sciences and economic science. The Technological and Economic Research Center of the State Council has accomplished a lot in this area. Further attention should be brought to the integration of natural sciences and economic science.

Qian Xuesen: Comrade Ma Bin [7456 6333] of the Economic Research Center of the State Council is very supportive of the work of constructing economic models. The support of the leaders in related areas is vital to furthering the development of this task. I suggest that many entities be created and dedicated to the research and practice of economic systems engineering. It is imperative that specialists with many years of practical experience in economic matters as well as economic theorists join these entities. Their working experience and knowledge of social science theories are very much needed for ideological guidance. Because of the complexity of the problem, mathematical theory problems will also come up. Thus, the participation of mathematicians is needed, such as Beijing University's Professor Liao Shantao [1675 1472 3447], whose expertise in differential dynamic systems is very important. It is also necessary to invite some experts on non-equilibrium system theories such as Professor Fang Fukang [2455 4395 1660] of Beijing Normal University. Of course, the Systems Science Institute of the Chinese Academy of Sciences is an important organization that has worked on problems in this area. In conclusion, it is to make natural sciences play an important role in economic management area and to accelerate the progress of management modernization through the cooperation of economists and natural scientists.

12922
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NATIONAL DEVELOPMENTS

STRATEGIC COUNTERMEASURES FOR S & T DEVELOPMENT DISCUSSED

Taiyuan JISHU JINGJI YU GUANLI YANJIU [RESEARCH OF THE ECONOMICS AND MANAGEMENT OF TECHNOLOGY] in Chinese No 3, 20 Sep 84 pp 14-17

[Article by Zeng Duanxiang [2582 4551 4382]: "The Three-Dimensional Perspective of S & T Development and Our Strategic Countermeasures"]

[Text] S & T development has its own law and perspective. How we make use of modern scientific theories and methods to analyze the perspective of S & T development of the world and China and to formulate our strategy and countermeasures is an urgent task which will actually determine whether we can successfully carry out the four modernizations program and meet the challenge of the new technological revolution.

I. Observing the S & T Perspective from System Theories

The long history of man is a huge system to understand and transform the world. S & T are a productive force, a component part of the production and work processes and a method and tool to scientifically understand and transform the world. Production tools are merely an instrumental form of technology, or a materialized science. Therefore, the emergence and development of S & T is a large system within a huge system which resides in understanding and transforming the world from a lower to a higher level. This large system has a process of emergence, development and formation. It has many key elements--each S & T item; it has its numerous component points--the emergence of each S & T item; it has its own development lines--the application and popularization of different S & T items; and it has its own stages of leap and change--each worldwide S & T revolution. This system is a gradually expanding three-dimensional perspective. No doubt, by understanding the characteristics and law of the S & T development of mankind or a specific country, we can put S & T in the form of a system and observe it as a system. The three-dimensional perspective of S & T development which we put forward is to the point and comprehensive. There are four reasons for this:

First, the key elements and structure of S & T are three-dimensional. S & T are a productive force so that we know the key elements of S & T must necessarily be of a three-dimensional structure: (1) those who know S & T well; (2) equipment (and tools) which carries technology; and (3) objects which accept technology. The three are interdependent and are all

indispensible. The advanced character of the key elements is the synthesis of the three and the relationship among the three affects the emergence of new key elements.

Second, the emergence of new S & T elements is three-dimensional. S & T are an integral whole and the emergence of each S & T item is a three-dimensional function of time, place and conditions. We should say that S & T had distribution of "points" even in ancient times, as exemplified by the four major inventions in ancient China. The distribution of points in S & T reflects the effective needs and the level of the productive force in the society and economy at the time. But why is the invention of the rocket a recent event? This precisely shows that the emergence of a S & T item is not coincidental but is a multi-dimensional function.

Third, the development of key S & T elements is three-dimensional. S & T can only display its might in a certain space and time. Because of the stratification of human knowledge and practice, the space-time distribution of the effect and function of key elements will have stratification. Man lives in a macro realm and is active in a small dimension. Undoubtedly, the emergence, development and application of S & T first take place in the macro realm, such as automobiles and ships. Along with the continual deepening of knowledge and refinement through practice, the function of S & T deepens into the micro realm such as particle beam technology. At the same time it has expanded into the cosmic realm such as radio astronomy. Therefore, from the viewpoint of spatial development, S & T can be divided into the three-dimensional macro, micro and cosmic technology.

Fourth, S & T revolutions are three-dimensional. So far, three industrial revolutions centering around the technological revolution have taken place. We believe that each case was a leap and change which forms the three-dimensional perspective of S & T. The first one occurred from the mid-18th century to the mid-19th century. The leap and change were the invention of the spinning machine and the manufacturing of various work machines. The appearance of the steam engine enabled natural forces to gradually replace human labor and large-scale industries to gradually replace workshop handicraft industries so that productive forces developed tremendously. The second one was the industrial revolution from the 1870's to the time prior to World War II. Its characterisitic was the popularization and use of electricity and the gradual replacement of the steam engine by the internal combustion engine. Not only was there significant development in the electrical equipment, electric power, railroad, shipping, metallurgical and machine manufacturing industries, automobile, aircraft and other new industrial departments also arose. Because of the invention of electricity and solution to the problem of allocation, transmission and transformation of 9lectricity, "all forms of energy--heat, mechanical movement, electrical, magnetic and optical--can be transformed from one to another and can be used in industry." "Moreover, industry can almost fully free itself from all new limits set by local circumstances, making it possible to utilize extremely distant hydropower, ... and making it the strongest and most effective leverage to eliminate the antithesis between town and country." ("Selected Works of Marx and Engels." Vol 4, People's Publishing House, 1957, p. 436). Therefore, the second industrial revolution enabled the system to complete the

leap and change from "lines" (the emergence of each technological item is a line) to "planes" (the organizations of various big firms, trusts and joint enterprises). The third revolution was after World War II to the early 1970's. This was a technological revolution symbolized by atomic power, space technology and particularly electronic computers. Of course, it should also include major development in automatic control, remote sensing, remote control, remote testing, laser and the synthetic material industry. This was an overall technological revolution which enabled the completion of the macro spatial structure of the system from "planes" to "body" (the large S & T system is primarily based on various S & T centers). At the same time, lines developed into planes in the micro realm and points leaped and changed to lines in the cosmic realm. This technological revolution opened up a new era for man's conquest of nature. It was not only a revolutionary leap and change for S & T itself; it was also a leap and change in the process of direct use of S & T achievements in the national economy. The use of electronic computers has partially replaced human mental strength and altered the state that machines could only replace physical strength. In the past we could only "use machines to make machines"; today we can even "use machines to control machines." In the past we could only use machines to control machines on land; today we can even use machines to control machines in the sky. Distances far and near, in the sky or on land, in the macro or micro realms, computers are in control through information. This initially completes the three-dimensional structure of the system in the macro realm. Therefore, the world's S & T system is a large system with many levels which gradually expands and develops.

The description and measurement of the nature and characteristics of the large S & T system will therefore require many indicators. Here we put forward three indicators of characteristics: expansion rate, technological density and technological gradient. So-called expansion rate refers to the speed of development of points, lines, planes and body. Obviously, the distribution of points from the ground state level to the first level of leap and change took several thousand years. The first leap and change took over 100 years, the second took 70 years and the third only took about 30 years. Someone said that S & T develops in acceleration, which is not an unreasonable statement. So-called technological density refers to the proportional density based territorially between advanced technology (technology in the third industrial revolution) and intermediate technology (technology in the second industrial revolution) as well as traditional technology (technology in the first industrial revolution). It should include the relative density of the distribution of points of leap and change in all three revolutions, particularly the proportional density of energy solution and the density of circulating technical information of advanced, intermediate and traditional technology. High densities indicate more advanced development in S & T, while technological gradient refers to the differences in comparing technological densities based territorially, which should include the gradient of human technical quality, gradient of technical equipment and gradient of technical management. Obviously the three indicators of characteristics are also suitable for use in the subsystems. Studying the relations among the three and their external connections particularly the transformation mechanism with economic effects, is an effective way to correctly understand the past, present and future of man's S & T development.

We believe that the new technological revolution in the macro realm is an intensification and continuation of the third technological revolution because the leading technology of these two revolutions are consistent. Nevertheless, the new technological revolution will cause leaps of the system in the micro or even cosmic realms of technology, particularly the orientation of the system toward information and knowledge. Information exists and penetrates everywhere and nothing can block it. It is transmitted rapidly and is exchanged instantly, and its storage is miniaturized. It also has external expansion of high density subsystems. This poses for people many urgent problems that must be promptly solved. It is urgent that we understand this trend and to determine the proper countermeasures.

II. Determining S & T Strategy From Cybernetics

The formation of the S & T system is the result of human practice and the crystallization of human wisdom. It is the common wealth of mankind. Of course, S & T should not have national boundaries, but due to the three-dimensionalism of the structure of key S & T elements, those people who know and create S & T have a class character and have national boundaries. Therefore, the large system of S & T also forms subsystems based on countries. Understanding the large system and analyzing and controlling the subsystems is the key to meeting the challenge and formulating China's S & T strategy.

We believe that the modern S & T strategy of a country should have five characteristics: (1) overall importance, (2) comprehensiveness, (3) stability, (4) optimization, and (5) resistance against interference.

The period of our strategy is from now until the year 2000. Our goal is to quadruple the total industrial and agricultural output value in our national economy and to attain a national S & T level equivalent to that of developed countries at the end of the 1970's and early 1980's. We keep abreast with developed countries in some of our regions and certain technology and we can make use of cybernetics to realize this strategic goal. So-called cybernetics primarily studies the law of movements of the state of a system and changes the method and possibility of this law. Study means analyzing problems and change means synthesizing (engineering system is design) problems. If this change concerns the overall situation, it would have strategic significance. Analysis is for understanding the law of movements in the system, and synthesis is to control these movements so that the expected goal will be reached. To control the movements of the system we must be totally clear about the basic circumstances of the system. To be sure, we still cannot give a specific equation on movements in our system. But the three indicators of characteristics of basic development level, trends and static state of the system can be computed and analyzed. Our current S & T level is 20 years behind developed countries and the three-dimensional expansion rate of our system is relatively slow. Take technological density for instance, we have old handicraft labor and production by animal power as well as technology from the first, second and third industrial revolutions. Moreover, the three types of labor intensive, capital intensive and knowledge and technology intensive industries all exist. It is only that the proportion of advanced technology is small but the technological density along the coastal areas is higher,

while the technological gradient is basically consistent with technological density. Currently in China, "several hundred million people are occupied in producing food, and the problem of grain has not really been solved yet." ("Selected Works of Deng Xiaoping," p 87.) In other words, the technological density of the broad countryside is small so that the technological gradient is large on the national scale. However, our system has many advantages. First, due to low density and large gradient, there are adequate selectiveness and flexibility in the distribution of new points, the shifting of technology is highly possible and the system does not have the problem of external expansion. Second, the system is large and resources are abundant. There are inexhaustible resources in the air and seas. Third, what is basic is the superiority of our social system. Our people are hard-working, daring and intelligent, and guided by the party there are ways to design and control the development of our system. Only if we take a broad and long-term view, develop our strong points and avoid our weak points, and determine the amount of effective control over the state of movement in our system, we will be able to attain our anticipated goal, or to determine effective policies and principles to satisfy the five major characterisitcs of our strategy. We can draw up five basic strategic principles according to our basic national conditions in order to satisfy the demands of our strategic characteristics.

(1) Give play to our favorable situation, coordinate relations, pursue overall development;
(2) Base ourselves on current conditions, make major breakthroughs, actively import technology;
(3) Stress key links, exercise effective control, ensure long-term stability;
(4) Build centers, concentrate information, optimal control;
(5) Remove interference, make couplings, advance in high speed.

III. Formulate S & T Countermeasures from Information Theories

We believe that strategies and countermeasures are different. The former concerns the overall situation and integral whole and has generality and sense of principle; the latter refers mainly to measures and policies and may be by stages and in parts. Those that serve strategies appear as even more specific methodology. In that case why do we need to proceed from information theories in formalating countermeasures? This is because from the standpoint of the composition of the S & T system, our strategic goal and strategic policies and principles actually require the completion of the leap and change from "planes" to "body" of our system in the overall situation while the greatest characteristic of the lead and change of the S & T system from "planes" to "body" is the application of information S & T. Information is the "blood" of the system and information channels are its "blood vessels." Information links the S & T system and the entire society just like rubber belts or gear linking machinery parts. In other words, we must obtain the information for formulating countermeasures from technology which stresses information technology. More important, in a broad sense, countermeasures are also within the bounds of information and we must study countermeasures from the viewpoint of information science.

Since we were not late in distributing and making a start in our atomic energy technology, synthetic materials, automated technology, laser, remote sensing,

remote testing, remote control technology, particularly electronic computer and other electronic industries, and since their developments have not been slow, it is possible for us to enter the information society at the same time with developed countries in the world if we do a good job in making use of S&T information. Because we do not have crises like those of the superpowers, along with the intensification of the four modernization program and S & T development, people's activities will gradually enter the level of systematization, synthesis, and becoming scientific and there will be myriad changes in the state of movements in the circulation of people, materials, wealth and energy. Along with the instantaneity, diversification and acceleration of the movements of these four kinds of circulation, with this information flow as the source of information, in terms of quantity it may produce, transmit, scatter and reflect with an "explosive" tendency and in terms of quality it is numerous and complicated, highly divided, with intersecting and overlapping and even interference. Different visible and invisible information channels which are inestimable form networks by various coupling methods, linking all trades and professions and all units and to form an organic whole. No doubt, these brand new characteristics of the emergence, transmission and exchanges of information flow of the four modernization program have provided new standards and scientific substance for us to formulate S & T countermeasures.

A. We must build a S & T system in which research and application are an integral whole. According to Wiener, the founder of cybernetics, information is "a measure of the degree of organization" of things. It is for sure also an appropriate definition of organized management of information. To make S & T progress, management of information is highly important and transmission must be rapid. As an S & T system, on one hand it must have scientific planning and strict organized control over the people, wealth and materials concerned, and on the other hand it must solve the effective coupling of research and application. For effective coupling, first there must be a flow of qualified people who will give full play to their talents; second, achievements must be popularized and yield their best results; third, there must be new equipment and things must be fully made use of. Only by integrating research and application, technology and economics can we enable the internal and external relations of units to be closely linked. This will suit the sharp increase, diversification and acceleration of information. The integration of research and application, circulation of qualified persons and popularization of technology in effect links up information channels and increases S & T density.

B. We must popularize an effective system of S & T responsibility. Structural and organizational reform is undoubtedly important to the realization of our strategy, but the popularization of a system of responsibility is also very necessary because the key to research on whether achievements are possible is the extent to which tasks are carried out and the degree of enthusiasm of the persons responsible. The system of responsibility solves the problem of tasks being undefined and breaks free from "eating out of the big pot." From the viewpoint of information science, it increases the quantity of information in S & T research. Information science holds that the quantity of information is equivalent to the clearance of the undefined character in things--the unprescribed reduction in quantity. It appears that

we can implement the "five fixes" in the system of responsibility: fixed quotas, fixed staff, fixed time, fixed expenses and fixed results.

C. We must build a "four modernized" cadre rank. The leap and change of S&T and the concentration of knowledge require a strong S & T research contingent to produce techniques and achievements. However, turning S & T achievements into productive forces not only requires a highly proficient S & T personnel but also large numbers of management specialists. That is, it requires cadres to be sensitive to receiving S & T management information, speedy in transmitting and effective in processing them. Moreover, it requires cadres not only to have socialist morality but also a high level of education, meeting the standards of "becoming more revolutionary, younger in average age, better educated and professionally more competent." One of the goals of the reform currently being carried out in society is to solve this problem.

D. We must strengthen intellectual investment and development. Another major countermeasure for the realization of strategy is to drastically improve the scientific and cultural levels of the whole nation. The implementation of this countermeasure is entirely in the development of education. By stressing education, having educated and qualified persons is to improve the whole nation's sensitivity in receiving information and the ability to transmit and process information. In the leap and change in S & T, with the popularization and use of microprocessors, key S & T elements may undergo profound changes, that is, man becoming knowledgeable and professional; equipment becoming intelligent and smaller in size; and the objects of technology becoming diverse in forms and fast-changing. If staff members are to meet the requirements of S & T quality, it is possible for us to make a direct transition toward building a highly technology and knowledge oriented, precision type of industry. But the ultimate question in the development of education is intellectual investment and development. The experience of developed countries are worthy of reference. The party Central Committee has strongly emphasized education in recent years and strengthening intellectual investment and development is another major policy decision.

In short, only if we adopt the attitude of seeking truth from facts, make use of scientific theories and methods, know the law of S & T development in the world and China, determine our strategic countermeasures in science, under the leadership of the party we can surely score victory in the new technological revolution.

9586
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NATIONAL DEVELOPMENTS

NEW SCIENCE AWARD EXAMINATION COMMITTEE SET UP

OW261352 Beijing XINHUA in English 1313 GMT 26 Mar 85

[Text] Beijing, 26 Mar (XINHUA)--A new national examination committee, responsible for the work of appraisal, approval and conferment of science advance awards, was recently set up in Beijing.

Yang Jun, vice-minister in charge of the State Science and Technology Commission, is chairman of the committee.

At a meeting held here last month, the committee decided to call a national conference in Beijing in the fourth quarter of 1985 to present awards for 1,500 scientific and technological advances.

In September 1984, the Chinese State Council issued the "Regulations on awards to promote scientific and technological advances."

The new science awards are given for scientific research that bring economic and social benefits to China's modernization and groups or individuals making creative contributions to popularization of advanced scientific research results, and to scientific management, standardization, metrology and technical information.

The awards are in three classes with special class awards to major contributions.

Since awards for inventions were announced in 1978, more than 900 prizes have been handed out. Of those prize-winning inventions, more than 95 percent have been put into use.

Only one special award has been given so far. This went to Yuan Longping and 500 agrotechnicians from 50 units for developing Xian-type hybrid rice. Over a 5-year period, the hybrid was sown on an aggregate 22 million hectares and brought about an increase of 16.5 million tons of grain.

Natural science awards are for major theoretical and basic research that significantly aids development of science and technology.

In 1982, China made 124 awards including those to earth scientists for discovery of Daqing oilfield which now produces more than 500 million tons of crude oil a year, to molecular biologists who worked on the complete synthesis of bovine insulin and to mathematicians for the solution of Goldbach's conjecture. Some departments in the country also give rewards to scientific workers making outstanding achievements in their work. For instance, the China Association for Science and Technology recently awarded prizes to seven scientific workers for their excellent work in popularization of agricultural science. Professor Zhang Wencai of the Central China Agricultural Institute received 10,000 yuan for his contribution to China's citrus production.

CSO: 4010/116

NATIONAL DEVELOPMENTS

USE OF MICROCOMPUTERS, UNICOMPUTERS RISES

OW261824 Beijing XINHUA in English 1543 GMT 26 Feb 84

[Text] Beijing, 26 Feb (XINHUA)--Computation and information processing have largely been computerized in most of China's major oilfields. Microcomputer systems are now used in safety supervision on high-voltage power transmission lines to ensure their smooth operation. These are examples cited by central authorities to show the growing use of microcomputers, now receiving top-priority in China's economic and scientific development.

China now uses more than 20,000 microcomputer systems and unicomputers, which are reasonably priced and easy to operate.

A computer center at the Ministry of Metallurgical industry now does the elaborate job of collecting and processing daily production results from key enterprises and finishes it in half an hour. It replaced a team of specialists on 1 August, 1983, who had to work for hours every morning getting the figures by telephone for compilation and processing.

The machine-building industry is using computers to work out the designs of products. Some machine building plants use computers to control production processes.

Departments of railways, communications, commerce and materials supply are using computers to seek the best transport routes. Thanks to the use of computers, the nation's annual cost of railway transport for chemical fertilizer, iron ore and gasoline has been cut by 17 million yuan (about 8.5 million U.S. dollars) a year.

In agriculture, computers are being used to store data on crop resources and forecast plant diseases and pests over large areas. Computers are also aiding flood control, an annual event in China. One example was provided by the fight against the Chang Jiang flood in the summer of 1981, when torrential downpours hit areas in the upper reaches of the river, threatening Wuhan and other major cities downstream. Electronic computers helped acquire accurate hydrological information, and on that basis a decision was made not to use the Jingjiang Flood-Diversion Project, a low-lying area surrounded by dykes to be used for lood diversion in times of emergency. This saved crops on 40,000 hectares of farmland in the flood-diversion area.

CSO: 4010/60

NATIONAL DEVELOPMENTS

COMPUTER CORPORATION SET UP IN BEIJING

Beijing XINHUA in English 0633 GMT 18 Feb 84

[Text] Beijing, 18 Feb (XINHUA)--Beijing Information Industry Corporation, a new economic entity, has been jointly founded in Beijing by the Ministry of Electronics Industry and local computer institutions, today's BEIJING DAILY reports.

It aims to pool and centrally plan the city's technical forces to speed up the development, production and application of computers in Beijing as part of the effort to make the capital the computer research and production center of northern China.

With a technical force of more than 33,000 in computer research and production Beijing has readjusted its computer enterprises and their product mix to coordinate these institutions better than before.

The new corporation has 13 component units, including computer research institutes of the electronics industry ministry and computer factories, service centers and polytechnic schools in Beijing.

Its board of directors comprises a group under the State Council in charge of large-scale integrated circuit development, the Ministry of Electronics Industry and Beijing Municipality. The chairman of the board is Li Rui and the general manager is Gong Yuntao.

CSO: 4010/52

NATIONAL DEVELOPMENTS

FUJIAN FORGES AHEAD IN ELECTRONICS PRODUCTION

OW191055 Beijing XINHUA in English 1030 GMT 19 Mar 85

[Text] Fuzhou, 19 Mar (XINHUA)--Fujian Province, whose electonics industry leapfrogged from the nation's eighth place in 1983 to sixth last year, is forging ahead in this sector, provincial officials said here today.

The total output value in the first two months of this year reached 213 million yuan, 2.2 times that of last year.

The number of major products including televisions, radio-cassette recorders and microcomputers turned out in the first two months was double that of last year, but the industry still cannot keep pace with increasing market demand.

The province plans to double last year's total output this year.

It produced 970 million yuan-worth of electronic products last year, a more than 100 percent increase over 1983.

Fujian signed 28 contracts with foreign firms to import advanced technology and equipment last year; twenty out of the 29 planned projects have already gone into operation and will help add 180 million yuan to the provincial industrial output value.

Fujian's 100-odd electronics factories, four research institutes, three corporations, four Sino-foreign joint ventures and 12 joint enterprises between Fujian and other provinces attach great importance to raising quality while developing new products.

Altogether, 53 new primary products and 53 new electronic components went into mass-production last year, adding 95 million yuan to the industrial output value.

An exhibition of advanced foreign electronic products and equipment, a showcase of the world electronics industry, was recently held in Fuzhou, capital of the province. More than 300 scientists and technicians from across the country were invited to visit the one-week show.

CSO: 4010/111

NATIONAL DEVELOPMENTS

SUGGESTIONS FOR DEVELOPING CAD SOFTWARE INDUSTRY

Tianjin JIXIE SHEJI [MACHINE DESIGN] in Chinese No 3, 1984 pp 22-25

[Article by Wang Zhonggi [3769 1813 3825] and Liu Chengfang [0491 6134 2455] of the Department of Mechanics, Tianjin University: "Actively Develop Exploitative Research Into Microcomputer CAD Software for Mechanical Design"]

[Text] I. A Survey of Computer-aided Design Technology (CAD)

With the constant development of science and technology, computer applications in product design, production activities, and production management in recent years have become more and more common. In product design, use of the computer is certainly not limited to use in complicated scientific calculations, but has already been used to aid design. CAD is an integration of computer-aided analysis and computer-aided drafting, together with interactive human-machine activity. Computer-aided analysis includes: 1. search for relevant materials and automatic handling of complicated calculations. For example, as in finite element calculations and calculation of methods of optimization. 2. Making logical decisions on design schemes, data, drawings, and curves. 3. Carrying out simulation analysis on machine systems or individual machines and their structures. 4. Carrying out empirical analysis. Computer-aided drafting includes: 1. drafting of machine parts, components, structures, and overall views. 2. Drafting of curves for machine performance, physical performance, and dynamic states. 3. Drafting data tables and statistical charts. What is more, it can revise schemes, parameters, figures, and characteristics curves through human-machine interaction to obtain optimal design results. At present, CAD is just being perfected, moving from CAD to CAM, which is a system of computer-aided design and computer-aided manufacture. That is, besides taking on the optimal comprehensive design discussed above it can enter designs and data onto disks or punched tape, by which numerical controlled machines can then be controlled, effecting unguided product machining. One can also directly control the processing machinery with the computer that has done the design calculations for complete product machining.

Because of the far-ranging superiority of the CAD systems they have developed vigorously abroad under fierce capitalist competition. For example, work is already being done abroad using computer-aided workstations, of which the United States has about 1,500. Eighty percent of the machine parts for the American Columbia space shuttle were designed by CAD systems. The American Boeing Aircraft Company designed the Boeing 727 using CAD, with a 100 percent improvement

in production efficiency. Lockheed Aircraft Company uses CAD in structure design, where it dynamically displays the states of motion of a mechanical system on the screen. It can also analyze and display the state of the load on mechanical parts and system deformation, and do simulation and emulation to save costs of experimentation. There are about 110 people in England's Cambridge University "CAD Centre," the task of which is to set up data bases, some 30 percent among them being data bases for the machinery industry. The British Leyland Company car body factory has set up an automobile simulation and analysis system, which uses CAD to design the power train, chassis, cooling system, and body. The British machine tool industry is researching how to link up minicomputers with CAD centers through high speed channel machines for automatic design of various machine tool shafts and bearings. Japanese ship building factories use CAD to do calculations for some typical often used naval designs. In 1973 the Japanese Toyo Denkikoshi [Oriental Electrical Machinery and Appliances Company] formulated automatic design software for 185-750 dc machines. Computer-aided design of machine parts and components (as with cams, gears, shafts, bearings, etc.) is already quite mature abroad. It has now even developed to the point of integration with CAM, which establishes an organic integrated manufacturing system. In 1968 the Italian Olivetti Company began to use CADAM to write DPTA programs for designing dies for standardized parts, which enables design time for the dies to be cut 60 percent, a reduction of 30 percent in skilled labor required for manufacture of the dies, a 20 percent reduction in the cost of pressing parts, and a 60 percent improvement in productivity. The numerically controlled processing programs of that company have come into general use.

In the last 2 or 3 years work on CAD in this country has also developed quickly. We have brought in some foreign CAD systems which have earned the respect of many factory enterprises, colleges and universities, and research organizations. And, there have been gratifying developments in chemical industry machinery, aircraft dimensions, electric power machinery, building structures, machinery parts, dies, and textile technology and artistic pattern design.

II. We Must Actively Develop Exploitative Research Into Microcomputer CAD Software for Mechanical Design

China is a developing socialist country which in comparison with developed Western nations has greater population, a weaker economic base, insufficient technological capability, and a rather low level of production and labor productivity. For these reasons exploitative research into CAD software has especial significance. In addition, it must be suitable to China's national situation, it must follow our lead, and it cannot completely indescriminately imitate the CAD systems of capitalist nations. Based on economic conditions in our country we cannot bring in great quantities of mainframe computers and CAD systems from abroad. Everyone knows that the price of imported software is very high. What is more, the raw data for material used in foreign mechanical design software data bases, their mechanical performance, and their standards is not always the same as that in China. To blindly copy its use is certain to lead to erroneous design results. Then, what CAD software would suit China's national situation? It is our belief that in addition to organizing our capabilities to study and develop imported mainframe CAD system software, there would be even greater and broader real significance in actively developing

exploitative research in and the spread of microcomputer mechanical design software and the software of other professions and industries. This is because microcomputer CAD software not only has the general characteristics of mainframe CAD software, but has other unique advantages.

Their mutual characteristics are:

1. Reduction of design time. Through data bases, CAD can rapidly control the data and figures and lines needed in designing. Its quick calculation speed and high degree of accuracy in calculation as well as its ability to automatically draft figures and to avoid the drawbacks of manual calculations can greatly reduce design time.

2. Improving design quality strengthens the ability of a product to compete and the economic results thereof. One of the keys to quality in mechanical products is in design. In design tasks where there is a great deal of design to be done and requirements for accuracy are high, manual calculations cannot satisfy those demands for accuracy, and the requirements for design quality and deadlines can only be met by CAD. At the same time, tasks which by hand are too loaded with trivial details or are simply impossible to do by hand, as for example finite element calculations or complicated component strengths, which can only be done by computer. Moreover, CAD systems can comprehensively take into account the effects of all design parameters.

3. They have changed traditional manual methods of design and methods of new product development. For example, the methods of linear programming, nonlinear programming, optimization theory, and tree search techniques developed in artificial intelligence are already being used in mechanical design. Developments in CAD will further change traditional design methods and new product development methods.

4. They will gradually remove the limits of design and manufacture--eliminating blueprints. With the integration of CAD and CAM, we can use the computer to both design and control machine tool manufacture of parts, to undertake automatic assembly and inspection of products, and can see design and manufacture as a whole. Abroad, they are already using the computer to join design, production, and management and to implement flexible automation for multi-variety small batch processing.

The unique advantages of microcomputers are:

5. Low cost. One mainframe computer with a CAD system costs from in the hundreds of thousand yuan to several million yuan, while a microcomputer costs from only several thousand yuan to some tens of thousand yuan. The average factory or enterprise, school, or design and research unit has the capability to buy that. Also, writing and using software is convenient. They can solve both design problems where the factory or enterprise is far from a mainframe as well as avoid having mainframe users excessively collected together, overcoming the phenomenon of "overkill." At the same time it reduces the rather high on-line fees paid out when units from small-to-medium-sized enterprises write and use software on the mainframes.

6. Maintenance and management are more convenient. Maintenance and service demands of microcomputers are low, that is, they do not require special rooms or buildings and it is easy to train administrative personnel. The average base unit has operational conditions.

We believe that although operational speed is slower, because of the microcomputer's unique advantages it is sufficient to satisfy the speed requirements of general mechanical design and other areas. What is more, when equipped with software for human-machine dialogue design personnel do not require special training but can still quickly master their use. If hardware interfacing techniques are mastered and we organize our abilities to exploit and study microcomputer mechanical design CAD software with Chinese character processing, then the application of microcomputers in mechanical design has a very expansive future. It will be sure to gain comprehensive and enormous economic results in mechanical engineering and in other aspects, as well as train a large group of mechanical design software workers under the policies of self-reliance.

III. The Work We Are Doing

In the mechanical design CAD software development field our work has just begun. Over the last 2 years our department has written software for the design of machine parts that can run on common microcomputer systems. If we can have general purpose compression spring, tension spring, torsion spring, etc., software already input for use then that has obvious design effectiveness. With a capability of human-machine dialogue we can quickly design 30 kinds of spring material in over 18,000 series dimensions, providing the structural dimensions suited to the series standards. We can as well automatically use various denotation to display the results of trial calculations for static strength, fatigue intensity, stability, resonant conditions, etc. In this way the factories concerned welcome allowing tedious designs, where one is required to constantly consult manuals in the design of spring parts, to be reduced from the several days time by hand to a few seconds. Studies of and software writing for the mathematical modeling of other parts and mechanical systems are also just in research and preparation. Together with our fellow units we hope to fill the gaps in China's mechanical design CAD software that can run on microcomputer systems, and set up a complete system of mechanical design CAD software for general use in China.

IV. A Few Suggestions

We have at present already imported some mainframes and CAD systems, and microcomputer systems have already begun to spread, but the preparation of CAD software is still far from meeting needs. We have the following few suggestions for stimulating exploitative research in China's CAD software:

1. Establish a company for software development and distribution. Currently, we have no unified management structure for the various kinds of microcomputer CAD software. Each different system and unit is writing software, some of which is repetitious, some of which is kept secret, which is not conducive to broad use. We have no special agency appraising the quality of software. We recommend that the nation set up a company for software development and distribution. Formulating various specific rules for the development and distribution

of software would encourage and reward those personnel who had made contributions to the preparation of software. Actively disseminating CAD software that is economically effective and broadly serving the various professions and industries in our national economy would improve economic results and stimulate the four modernizations. To make a great effort at training software personnel and to encourage software personnel to get together with specialist engineers and technicians in various professions will speed exploitative research into the software for all professions and industries.

2. Make full use of the dominant positions of our colleges and universities to make contributions to China's software development. Colleges and universities have abundant faculty resources and capabilities, as well as a large group of graduate students. Courses are comprehensive, many schools have set up computing departments and software specialties, they have a mainframe computer and CAD systems, and use of microcomputers is quite common. We hope that the nation will fully utilize the beneficial conditions of colleges and universities, as far as personnel and equipment are concerned, which would strengthen a unified leadership and make a great contribution to the development of computer CAD software.

3. Broadly inform people of the great significance of CAD software development and respect the development and use of software talent. The computer is a machine and tool and only with the support of a great deal of system support software and applications software can it play its full role. Otherwise the capability of the computer cannot be fully realized. Currently, the price of software imported from abroad is very steep, some of which even exceeds the cost of the hardware. This must be looked at seriously. And in China there are still not many who work in software, and there is an even greater lack of personnel who specialize in writing it. Because the writing of software is extremely tedious and taxing work, much effort is required, because it is only with the hard work of software workers that the repetitious and tedious work of many other comrades can be lessened. Today, with few people and a shortage of software, we hope to create certain working conditions for software working personnel to improve their working efficiency. This will allow China's current computers to play even greater roles.

4. Increase investment in exploitative research for CAD software. After realizing the great use of the computer we have become sufficiently respectful of the introduction of computers and their manufacture. At present exploitative research into CAD software has already become a weak link. We suggest that our nation's relevant leaders and departments take seriously investment in software exploitative research. Besides bringing in key software we ought to pay attention to the acceptance of that imported software and advocate self-reliance. We should make use of our own technological capabilities, comply with our national situation, and actively initiate exploitative research into microcomputer CAD software. We should strive so that within a short time we can catch up to and surpass international advanced levels.

12586
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NATIONAL DEVELOPMENTS

SICHUAN DEVELOPS COMPUTER DIAGNOSIS SYSTEM

OW310936 Beijing XINHUA in English 0910 GMT 31 Mar 85

[Text] Beijing, 31 Mar (XINHUA)--Doctors of traditional Chinese medicine used to depend on their fingers to feel the pulse in diagnosing diseases, but they can expect computers to do the job.

Research institutes in Sichuan Province have succeeded in developing a computer programed diagnosis and treatment system for paralysis, gastrosis, alopecia, sinusitis, pediatric diarrhea, cough and other diseases, today's GUANGMING DAILY reports.

The experience of 12 leading doctors of internal medicine, opthalmology, gynaecology and pediatrics have been programmed in hospital computers, the paper says.

Some of the programs have been used in clinical treatment since 1981. Doctors in the province have treated about 10,000 cases with computers with a successful rate of 96.88 percent.

No error has been found since they were put into use, the paper said.

The program packet of diagnosis and treatment consists of a data base, an intelligence base and a control system, fully demonstrating the characteristics of traditional medicine in diagnosing and treating patients based on an overall analysis of symptoms and signs, including nature and other factors as well as physical conditions of the patient.

Developed by the Chengdu Institute of Computer Application, the Chengdu Institute of Traditional Chinese Medicine and the Daxian Prefectural Hospital of Traditional Chinese Medicine, the program packet was displayed at the Tsukuba International Exposition in Japan, which opened on 17 March.

CSO: 4010/119

NATIONAL DEVELOPMENT

MICROCOMPUTERS AID SHANGHAI AGRICULTURE

OW281252 Beijing XINHUA in English 1225 GMT 28 Jan 85

[Text] Beijing, 28 Jan (XINHUA)--Microcomputers are now being widely used to help modernize Shanghai's agriculture, according to Sunday's WEN HUI BAO.

More than 300 microcomputers are now in operation in Shanghai's ten suburban counties. There were only 10 in the middle 1970's, the paper said. Some 700 operators had been trained by the end of last year.

The computers are used to monitor and keep track of 70 agricultural projects including calculation of amounts of chemical fertilizer to be used, tracking data on pollutants in the soil, planning breeding of dairy cattle and forecasting the occurrence of crop insects and diseases.

Last year, according to the figures provided by computers, nitrogenous fertilizers were applied to 144 hectares of paddy rice fields in two production brigades of Qingpu County.

As a result, the brigades harvested 1,238 tons more of rice than the previous year and used nearly 2.6 tons less of the fertilizer, the paper said.

Using the computer-provided formula for making animal feed, the Shanghai Municipal Academy of Agricultural Sciences cut production costs by 10 yuan per ton.

A plan for the construction of an agricultural information center in Shanghai is now being drafted, the paper said. The center's computers will supply information to customers in the Shanghai economic zone covering Shanghai and four provinces surrounding the city, Jignasu, Anhui, Zhejiang and Jiangxi.

CSO: 4010/119

NATIONAL DEVELOPMENTS

COMPUTER APPLICATIONS FOR COMMODITY INSPECTION

Beijing GUOJI MAOYI [INTERNATIONAL TRADE] in Chinese No 35, Nov 84 pp 25-27

[Article by Zhang Ganfu [1728 1626 1133]: "Great Possibilities for the Application of Microcomputer Technology to Commodity Inspection"]

[Text] 1. Welcoming the challenge of the new technological revolution

The electronic computer is one of this century's most splendid scientific and technological accomplishments. With the fourth generation computers based on large-scale integrated circuits, computer technology spread like wildfire, quickly extending to all spheres of society after the appearance of the microcomputer with its low cost and outstanding capabilities, and is currently fundamentally changing commercial structure and having a deep influence on people's work and their life styles. Actual practice from many countries has shown that the rapid development and dissemination of the microcomputer can bring huge economic results.

The strong vitality of the microcomputer is due chiefly to its low cost, its great ability to process information, and it does not require much from the work environment, that it is dependable, and that it is easy to learn and use. In the past the computer was considered a treasure to be protected within an air conditioned double-layer glass enclosed room because of its high cost, to be operated by expert technicians, and only the most complicated calculations were qualified to be sent for computer processing. With the appearance of the microcomputer computers were freed from the hands of specialists to become an ordinary tool that the average person could use, which consequently opened broad fields of applications. In the sixties there were only some 300 fields of computer applications, which in the seventies had increased to 3,000, and which now have surpassed 5,000. Microcomputer technology has been used so broadly and quickly in various areas that in Japan it has been called the "Three 'A's Revolution," that is, factory automation, office automation, and home automation.

Faced with the challenge of the "new technology," and the "new production revolution," each country, each profession, and each industry is earnestly and seriously considering and searching for ways to deal with the situation in order to avoid falling behind others. At present, the new technology revolution is proceeding with the computer at its center and modernization cannot be undertaken without it. If we cannot quickly get on board, then in 10 or 20 years the gap will become even greater. This point is currently being realized by a growing number of people in this country. Polarization and application of the microcomputer is becoming a central topic of discussion as people discuss modernization. Domestically, all sorts of microcomputers have introduced production and manufacturing accomplishments, and great breakthroughs in information processing by Chinese characters have greatly advanced broader application of microcomputers in China. There is likely to be an upsurge in microcomputer dissemination in the next few years.

Commodity inspection departments are responsible for stimulating import-export business and for stimulating the four modernizations. Welcoming the challenge of the new technological revolution, adopting ways to deal with it, spreading and applying microcomputers, and promoting an overall rise in the level of inspection and management are new problems that have been posed to us by modernization construction.

2. Making use of microcomputers to gradually implement office automation

The computer is a machine for information processing and handling. Therefore the microcomputer can simply surge into office work that is centered on information processing and can provide a forceful method by which to improve the efficiency of office work. Experience abroad has shown that office automation can improve the individual office efficiency of management personnel by 25 percent and more.

During the 1970's abroad, office use of the computer and implementation of automation had fundamentally developed a maturity in the processing technology of any particular business. It is generally considered that office automation centers on the computer for processing of information and that it is supplemented by means of duplicating, microfilming, and communications to improve the processing efficiency of everyday office tasks. Chief areas are:

1. Word Processing and Management.

2. Electronic Filing and Retrieval.

3. Electronic Mail System, which uses computer-based message systems within an office system to automatically transfer information.

4. Teleconferencing System.

5. Micrography.

Looking at the foreign developmental process, there are generally three stages in office adoption of the microcomputer. The first stage began in the seventies, primarily with the introduction of individual machines, where every department of a business separately adopted microcomputer technology to handle individual tasks. At present, the microcomputer is generally universal and office automation has entered the second stage of development, which is currently moving in two directions: one is to improve levels by adopting high performance machines or high efficiency special machines. Another is to develop on-line systems, within a unit or an office building to organize microcomputer local area networks [LAN], to share resources within a system. The developmental aim of the third stage is to link up the LANs of the various departments with public information networks in the rest of society, creating information resource sharing throughout society. It is estimated that by the end of this century great advances will have been made toward this goal.

Commodity inspection is management of import-export products, the subject of which is information regarding commodities. Receiving inspection reports--obtaining information on the requirements for import-export commodities; inspection--obtaining information on commodity quality, quantity, packaging...; certification--handle all information together to provide it for use in forms for commodity inspection certificates. Intrinsically speaking, commodity inspection departments serve to provide information to society. The information that we provide affects the flow of commercial material--the import and export of commodities. Commodity inspection certificates are a kind of information commodity. If in addition to using methods of advanced technology to improve the level of commodity inspection we adopt the microcomputer to put office automation into effect and improve the efficiency of commodity inspection information processing, that will have a great effect on improving the quality of commodity inspection certificates and on shortening the time it takes to issue certificates.

3. Tentative plans for the application of microcomputers in commodity inspection work.

Based on the characteristics and conditions of commodity inspection work it is initially planned that the microcomputer will gradually be used in the following areas.

1. Word processing, especially in the printing out of commodity certificates: typing out certificates is labor intensive work where it is easy to make mistakes. More often than not one word will be mistyped and all that has been typed before will have to be discarded and it will have to be begun again from the beginning. Using the microcomputer the words that have been typed will appear on a fluorescent screen, which may then be conveniently corrected, added to or subtracted from, edited, and proofread, when certificates will be automatically printed out without error. The same microcomputer can process English, Chinese, Russian, Japanese, Greek, etc. Chinese characters can be entered into the computer by keyboard more conveniently and more easily learned than by Chinese typewriter. A great deal of the material that is signed and issued in regard to commodities is repetitious. Certificates for which the wording is basically similar can be stored on a disk in the computer. Then, when the computer is told the serial number of the document, the date, labels, name, and quantity, then the certificates can be automatically printed out. Five inch disks are about the size of phonograph records and each one can store 300 full pages of certificates in English. One kind of microcomputer-equipped English language typewriter has in itself the functions of display, storage, editing, and changing font type. It can be directly set up in a system with disk storage devices, and since the price is much lower than that of general purpose computers, it might be worthwhile distributing them first.

2. Reports, cost calculations, statistics, and filing: turn over this related repetitious recording, checking, and retrieval to the computer. Beginning with reports, the information is entered into the microcomputer, and proceeding with work internal to commodity inspection it is supplemented with information about conditions surrounding certificate issuance, all comprehensively handled by the computer. Calculation formulas may be entered into the computer beforehand to be automatically calculated. Statistics can be printed out by the computer in accordance with forms for reports. With the computer you can even set up electronic files for file storage of archive copies of certificates. At present national statistical collection still depends on the sending in of report forms, which takes much work and time, is long in duration, and the numbers for which are slow in coming. The European Community has more than 2,000 customs areas. Evey 10 days they do statistics on some imports that are allocated or limited, and without computerized methods of communication it would be impossible. It is said that in countries like Romania and Yugoslavia, where lines of communication are rather poor in quality, they are using transferral by disk to improve efficiency in statistics, which technique is not complicated and might apply to us.

3. The programming languages of BASIC, FORTRAN and COBOL suited to microcomputers can carry out numerical calculations for engineering, data processing for experiments, mathematical statistics and data analysis. Some inspection results, as with lists of serial numbers inspected or getting the average value of a variety of products, can be directly printed out onto documents after processing by the microcomputer, which saves many steps between inspection and certification.

4. Financial affairs, personnel files, instruments and equipment, goods and materials, criteria for inspection, and technical materials and information can all be progressively managed by microcomputer.

5. In the future when there is microcomputer remote on-line communications national offices can transfer files and resources to and from local offices. When microcomputers are on-line with mainframes at information centers there can be direct retrieval of inspection criteria and information.

The examples above are not all that microcomputers can do. With the dissemination of the microcomputer many new fields of microcomputer applications will open up. To put these plans into practice depends not only upon our efforts in the commodity inspection departments but is also related to the entire developmental pace and level of China's microcomputers. Therefore, the initial step ought to focus on development of single units and disseminating applications. The second step would be to set up intra-departmental on-line local networks. The third step is dependent upon conditions concerning the remaking of China's lines of communication, where when conditions are right we will have on-line communication between national offices, local offices, and individual offices.

4. Spreading knowledge about microcomputers, their active exploitation, and steady development

Applying microcomputer technology is a new task of exploitation and is not entirely a question of technology. Although application of microcomputers to management began early abroad with broad dissemination, nevertheless their development has not always been smooth. Reports have it that many businesses have had their ups and downs with computer applications, even giving up on them. There will usually be those within a business organization whose reactions to computer systems are radically different. Some will constantly complain, others wholeheartedly approve, and even today there are managers who doubt them. There is no surprise that this situation has arisen for when using computers within a particular environment, those using them will always evaluate them according to the work style that is their own habit. There is a certain distance between traditional methods,

working systems, file formats, terminology, and individual habits. Use of new technology requires a process of learning and adaptation. We want to make use of previous experience and lessons and try our hardest to keep on track and not make the same mistakes twice.

As we make use of microcomputers we want to manage well the three matters of dissemination of microcomputer knowledge, overall planning, and the development of applications software.

Experts have pointed out that difficulties in China's dissemination of microcomputer applications lie chiefly in "At present and in relation to computers, the professional structure of every profession and industry is in a condition of near or total illiteracy." The computer is an intelligent tool and its function and usefulness depend upon the level of knowledge of the person using it. Abroad, dissemination of the microcomputer is already great, but because the rate at which a person's knowledge of computers can be improved cannot keep up with the rate at which microcomputer products are improved, current microcomputers are only working at 20 percent of their possible role. The point at which we begin using microcomputers is not high and the most important measures are to use various methods to spread knowledge of microcomputers and to wipe out computer illiteracy. When everyone knows the ABCs of computers and can consider their own work in the light of computer technology, this will create the conditions for developing broad applications fields, and talent will emerge, as will results. When technicians of the commodity inspection system are gathered together, the average ability in foreign languages is quite high and with persons of various expertise we can develop that advantage.

There are many types and models of microcomputers and equipment installations should take into consideration the entire office, keep an eye toward the future, and plan overall. In these respects China has already had much experience and learned much. In recent years, with the introduction of many kinds, with many and varied models, many difficulties have been created for the training of domestic personnel, software development and exchange, on-line usage, and maintenance and service, which have blocked further development. Abroad, too, there have been similar lessons and warnings. When we introduce microcomputers we cannot deal with a "Universal Model," but must on the basis of thorough investigation and careful comparison select one or two models according to differences in scale among the various professions, and pool efforts to research utilization. We must give priority in consideration to models of computers that have the ability to handle Chinese characters, that have a high performance to price ratio, and that are from a country that is a major developer. LANs and on-line communications must be dealt with as early as possible, which must be considered now.

Development of applications software is the key to getting the most from a microcomputer. People compare hardware to the body and software to the soul. In preparing applications software we want to pay attention to transfer, exchange, and accumulation and use social forces and the results we already have to improve preparation efficiency and to avoid duplicate and ineffective efforts. Common software ought to pool efforts in dealing with key problems, and software to process similar tasks ought to be cooperatively prepared, results should be exchanged, and efforts unified. As sets of applications software are developed they should be constantly improved. We need to train a group of software experts who are thoroughly familiar with the commodity inspection profession, who as well understand computer technology. This will insure the preparation, maintenance, and revision of applications software and supplement continuity. At the same time we should set up libraries of software materials to collect domestic and foreign materials in a broad way to keep in reserve for preparing applicable software for commodities inspection. Use of microcomputers has just begun in China and their potential and level of development cannot be guessed yet, but will require abilities that follow in the tracks of technological development.

Computer applications can be divided into three grades. Routine management and office automation belong to the lowest grade, which is numerical data applications. The second level uses the ability of the computer to analyze and make decisions, as in artificial intelligence, establishing expert systems, helping people predict and make policy, all of which are knowledge applications. The third grade uses the computer for exploratory research, for invention and creativity, to summarize regular patterns, and to help people with creative mental efforts. Computer experts have predicted: "It is only a question of time before expert systems enter the office." With them, "it will be like having your most capable advisor sitting at your side, who at anytime you ask will bring you up to date." Both here and abroad, medical expert systems, geologic expert systems, accounting expert systems and chemical expert systems have already had gratifying results. We have reason to believe that the application levels of microcomputer use in commodity inspection work need not remain in the first grade. There will come a day when we, too, can sum up the knowledge and experience of commodity inspection, store it in a computer, establish libraries of commodity inspection know-how, and produce by research commodity inspection computer expert systems. Microcomputer applications have very great potential.

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NATIONAL DEVELOPMENTS

BRIEFS

SHANGHAI TO TRIPLE INTEGRATED CIRCUIT PRODUCTION--Shanghai, 11 May (XINHUA)--Shanghai is now producing 10 million integrated circuit bits and is planning to triple its annual output of bits by 1986, according to a recent technology meeting here. Of these, large-scale integrated circuits will then amount to three million. Shanghai started developing large-scale integrated circuits in the 1970s, and now produces more than ten varieties. Integrated circuits top the list of major technological projects of the Shanghai Science and Technology Commission for the coming three years. Others include 60 intelligence products; 200 microcomputer-controlled facilities to monitor production processes; optical fibre and cable production lines with an annual output of tens of thousands of kilometers of optical fibre and some ten thousand kilometers of optical cable; a production line with an annual output of a thousand computer terminals; 16 projects for developing the use of enzyme and microbial fermentation engineering; the clinical use of 6 kinds of monoclonal antibodies for cancer and hepatitis diagnosis; and the completion of laboratory testing of 8 genetic engineering projects. [Text] [Beijing XINHUA in English 1434 GMT 11 May 84 OW]

EDITORS TO PRODUCE COMPUTER TEACHING PROGRAMS--Beijing, 14 May (XINHUA)--An editing group to produce computer teaching programs for television was set up in Beijing recently, according to today's GUANGMING DAILY. Organized by the Audio-Visual Education Bureau under the Ministry of Education, the group is composed of members from 11 universities and colleges including Qinghua, Beijing and Nanjing Universities. Professor Jin Lan of Qinghua University heads the group. During 1984 and 1985, the group plans to produce 77 television programs on the basic theory and application of microcomputers and computer programming. These will be broadcast nationwide by China's central television network beginning next September. Text books explaining the television programs will be published by the Higher Education Publishing House. [Text] [Beijing XINHUA in English 0743 GMT 14 May 84 OW]

SIX MORE COMPUTER DEALERS--Marketing of IBM computers and software to China got a boost yesterday when six more companies were added to the list of authorized dealers. IBM China gave authority for the six to market and service the IBM personal computer, IBM PCXT and a Chinese language version of the IBM 5550 together with software for all three. Four of the newly-authorized companies are based in Beijing. The others are in Guangzhou and Shenyang. The total of IBM authorized dealers in China is now 13. Meanwhile IBM in Hong Kong has announced that the Kader Industrial Company--based in Hong Kong but with a manufacturing operation in the Shekou industrial zone in Shenzhen--is to upgrade its computing facilities in data processing with the installation of a new IBM system. [Text] [Beijing CHINA DAILY in English 20 Feb 85 p2 HK]

CHONGQING SETS UP COMPUTER DEVELOPMENT CORPORATION--Chongqing, 14 Jun (XINHUA) --A corporation to develop computer technology in southwest China was set up yesterday in Chongqing, Sichuan Province. The Xinan (Southwest) Computer Industrial Corporation is under the joint auspices of the Ministry of Electronics Industry and Chongqing. It will research and produce civil and military microcomputers, help popularize and apply computers, and train technicians for Chongqing and the southwest. It will also coordinate research and production in Chongqing, the largest industrial center in southwest China. [Text] [Beijing XINHUA in English 1539 GMT 14 Jun 84 OW]

JOINT MICROCOMPUTER VENTURE BEGINS IN HANGZHOU--Hangzhou, 26 Jun (XINHUA)--The first joint venture producing Chinese character microprocessors in China was inaugurated here today. Hangzhou Computers Ltd was established by the Hangzhou Automation Research Institute, the Zhejiang Provincial International Trust and Investment Corporation, and a Hong Kong firm. The company will produce microcomputers to process foreign and Chinese characters, develop software, and provide maintenance services for both Chinese and overseas customers. [Text] [Beijing XINHUA in English 1932 GMT 26 Jun 84 OW]

MINISTRY CUTS PRICES OF PRC-MADE COMPUTERS--Beijing, 28 Jun (XINHUA)--The prices of Chinese-made computers will be cut by 23.4 percent as of 1 July, according to an Electronics Ministry decision. The sharp drop in prices applies to more than 200 varieties including small-sized computers, microcomputers, single-board chips and peripherals. The price of the Great Wall branc microcomputer, the most popular in the country, will be cut from 36,000 yuan to 25,000 yuan (one U.S. dollar is equivalent to about 2.2 yuan). The cut reflects the gains made by the Chinese computer industry. In 1983 China turned out 3,449 microcomputers, 9,564 single-board chips and 12,700 peripherals, representing an increase of 120, 68 and 260 percent over the preceding year. Computers, especially the micro ones, are now used in industry, scientific research and national defense. [Text] [Beijing XINHUA in English 0927 GMT 28 Jun 84 OW]

SHANGHAI PRODUCES MICROCOMPUTERS TO STANDARD--Shanghai, 27 Feb (XINHUA)--Microcomputers designed to international standards are now in serial production in Shanghai. The first microcomputer of this design was made earlier by the Shanghai Computer Plant, and its quality was appraised and approved by a group of scientists from educational and research institutes. The computer's components, except for large-scale integrated circuits, are made in China and can be used on hundreds of microcomputers available overseas. The microcomputers being produced are suitable for applications in industrial automation, information storage, calculation and data processing. [Text] [Beijing XINHUA in English 0201 GMT 27 Feb 84 OW]

CSO: 4010/60

APPLIED SCIENCES

CHINA'S INTEGRATED CIRCUIT PRODUCTION

Beijing RENMIN RIBAO in Chinese 22 Aug 84 p 3

[Article by Pan Yujun [3382 3768 0689]: "'Tianguang Spirit' of the Tianguang IC Plant"]

[Excerpts] Tianguang IC Plant [Tianguang Electric Engineering Plant?] is located in the remote mountains of Qin'an County in Gansu Province and was established in the early 1970s. It was transformed from a failing small factory making microwave components to a key plant manufacturing large and medium-scale integrated circuits. It has successively developed five series comprising over 200 varieties of ICs with electrical parameters comparable to that of internationally known brands. In 1975, the plant began to surge forward with the arrival of deputy director, Zhao Yucheng [6392 3768 2052],. By June 1976, under his leadership, contracts were signed for 14 IC products which no onedared to undertake from the late Premier Zhou's meeting of "905" Key Construction Projects [Priority Engineering Objectives]. The workers used the products of the 60's as technological "foundation". By October 1979, they succeeded in developed 22 new product varieties for the ECL super high speed IC series and the final designs of these products passed evaluation. The indexes of performance of these products are comparable to that of famous U.S. brands, thus making major contributions toward equipping a large number of ICs for China's supercomputer as well as China's rocket launch vehicle test conducted in the Pacific Ocean in October 1980. Since these ECL dircuits, known as the "well-sold" products, the Tianguang [IC] Plant has not been satisfied with its achievements. The plant is now striving for newer electronic products to meet China's urgent needs in this area. The plant is under the leadership of Zhao Yucheng, now plant director, and Wu Yuanging [0702 6678 1987], deputy director/chief engineer. Last year, this plant reached the gross industrial output value of 39,640,000 yuan, and actual profit of 640,000 yuan, or all-personnel productivity total of 30,000 yuan. In the first half year, the gross industrial output value reached 71.6 percent of the annual plan, an increase of 64.6 percent over the same period of the previous year. The profit reached 66.72 percent of the annual plan, an increase of 99.7 percent over the same period of the previous year.

CSO: 4008/138

APPLIED SCIENCES

REMOTE SENSING USED IN OCEANOGRAPHIC RESEARCH

Beijing HAIYANG KEXUE [JOURNAL OF MARINE SCIENCE] in Chinese No 6, 9 Nov 84 pp 50-52

[Article by Ping Zhongliang [1027 0112 5328] of the Institute of Oceanography, Chinese Academy of Sciences: "Use of Remote Sensing in Oceanographic Research in China"]

[Text] I

In the past decade, remote sensing has been successfully applied in meteorology, agriculture, geological survey, drafting and oceanography in countries such as the U.S., USSR, Japan and Canada. The economic benefit is obvious. For example, the U.S. estimated that ocean satellites could bring in 0.8-1.4 billion dollars in fishing, land satellites could profit agricultural irrigation by 1.4 billion dollars, and weather satellites could reduce losses by 2 billion dollars. These countries have already developed and planned their space systems for the next decade. In the area of oceanography, in addition to using information gathered by weather and land satellites, the U.S. and Japan also plan to launch ocean satellites in order to initiate studies on wind, atmosphere, wave, current, tide, tidal wave, sea ice, water quality (chlorophyll and silt contents) and sea surface temperature. After years of hard work, China has formed a scientific research team in oceanic remote sensing. Moreover, some practical accomplishments have been achieved in various aspects of oceanography.

1. Transport of Suspended Silt

Suspended silt has a higher reflectivity in the visible and near infrared regions of the spectrum. Therefore, it is easy to observe the transport direction on a visible light pattern. According to the study performed by Yun Caixing [1926 2088 5281] in the red light region (0.6-0.7 nanometer), the grey scale displayed represented the silt content in a 1m thick water layer. They used satellite pictures to analyze the transport of suspended silt at the mouth of the Changjiang River and determined a preliminary diffusion pattern [1]. Based on the grey scale difference and actual survey report, the silt content at the river mouth was divided into four classes. Furthermore, the effect of the diffusion of silt and fresh water of the Changjiang was investigated by weather satellite pictures taken at different times.

The direction of the muddy arrow of a river along the coast can reflect the direction of the current flow. Ping Zhingliang used the water arrows of the Huanghe River and other rivers around the Bohai Bay (shown in the satellite pictures) to track the surface flow directions in various seasons and the diffusion patterns of the silt in the Huanghe River [2].

2. Concentration Distribution of Chlorophyll-a

Chlorophyll-a concentration is considered to be a major parameter for water quality and primary productivity. Experimental data obtained in the laboratory as well as in the ocean showed that phytoplankton (a chlorophyll carrier) exhibits unique spectral characteristics as compared to other suspended particles. Aerial remote sensing of the Bohai Bay showed that the chlorophyll-a concentration in the ocean is quantitatively related to the reflectivity data. The green region of the reflectivity curve decreases with increasing chlorophyll-a concentration. In infrared aerial photographs, the higher the chlorophyll-a concentration is, the deeper the blue color becomes. Therefore, the chlorophyll-a concentration in seawater can be measured and plotted from reflectivity data or from color information in infrared photographs [3,4].

Because of the high chlorophyll-a concentration in the Haihe River and the Jianyunhe Canal, chlorophyll can be used to trace the diffusion and dilution of polluted water from cities in the Haihe and Jianyunhe region in the Bohai Bay. It is more superior than ordinary tracers. It doesn't cost anything to use and deploy. Furthermore, it will not pollute the environment.

3. Ocean Thermal Field

The thermal radiation energy of a body is proportional to the fourth power of temperature. Therefore, the temperature difference in the ocean can be clearly reflected in infrared pictures (10.5-12.5 micron).

Liu Baoyin [0491 1405 6892] used a numerical method to establish a relation between the density of an infrared picture and the actual measured temperature. The density data obtained from the NOAA satellite infrared pictures was used to calculate the month by month temperature field of the East China Sea surface from October-March.

Zheng Anquan [6774 1344 0356] derived the surface temperature field over the Huanghai and Donghai Sea in winter based on infrared photographs taken by a weather satellite and some on-site measurements. Through various kinds of satellite pictures the characteristics of different ocean surface temperature patterns were analyzed. It was discovered that there is a "sandwich" structure in the water surface temperature distribution. It is comprised of a cold water stream surrounded by two warm water streams. Several coastal fronts were discovered along the Shandong peninsula, the Zhejiang-Fujian coast and South Korea. The surface current was discussed based on the characteristic surface temperature and these fronts.

Mo Qinsheng [5459 4440 3932] et al compared thermal infrared pictures with some hydrological and fishing data of the Huanghai Sea. They found that the

infrared distribution agreed very well with the measured isothermal lines in many areas. An area of high isothermal line density gradient is a high temperature gradient area. It is also a current boundary area in the infrared pictures. From years of fishing data, this is the fishing ground for purse netting chub mackerels and trawling hairtails[8].

4. Water Depth

The depth of a water body is determined by different grey tones in remote sensing pictures based on the principle that attenuations of incident and reflected light differ with varying water depth.

Xu Chenzhong [6079 7115 1813] et al performed three aerial polychromatic photographic experiments for remote sensing of water depth in the Dahaizi reservoir in the Nanboashan area, in reservoirs in the Changchun area and the Sandawang Bay in the East China Sea. They derived a theoretical formual for the remote sensing of the altitude angle of the sun, the selection of the optimal frequency band, the calibration of the off-axis effect of aerial pictures, the enhancement of pictures, and the limiting depth and accuracy in remote sensing.

5. Surface Wind Field

Remote sensing of the surface wind field depends on the function relating the microwave scattering coefficient, the wind speed and the orientation angle of observation. The surface wind speed and direction can be obtained by making simultaneous measurements in two different directions.

Sha Xingwei [3097 5281 0251] et al used a 3.2 cm microwave scattering device to conduct experiments on the Lusi Ocean platform in Jiangsu. Based on the experimental data and relevant information, a mathematical model for the microwave scattering characteristics and the wind field was obtained. Furthermore, an attempt was made to use these curves to indicate that the surface wind field obtained by remote sensing is in good agreement with that measured on site [6].

6. Surface Oil Film

Sha Xingwei et al investigated the microwave radiation characteristics of 8mm microwave under various experimental conditions of incident angle, polarization mode and oil film thickness [9]. When the incident angle varied in the 15°-45° range in the horizontal polarization mode, the 45° incident microwave is most sensitive to the oil film thickness variation. In the vertically polarized mode, the 45° incident microwave is least sensitive to the oil film thickness change. Therefore, a horizontally polarized microwave at 45° incident angle may be used to conduct remote sensing on the thickness of the surface oil film.

7. Optical Image Processing Technology

Significant progress has been made in the optical processing of pictures containing ocean information. Liu Zhishen [0491 2535 3234] and He Mingxia

[6320 2494 7209] employed frequency color filtering and multi-channel Fourier transformation to process several dozen satellite and aerial pictures along the Chinese coast with satisfactory results [7]. The pseudo-color density encoding could emphasize the distribution and movement of the silt at the mouth of the Changjiang River. The silt distribution at the mouth of the Changjiang could be obtained as a function of depth by comparing the results processed at different frequency bands. Some periodical information (such as waves) buried in noise could be clearly shown in the picture through the Fourier transform.

In addition, remote sensing is also valuable in the geological and geomorphological survey of coastal areas.

II

The author believes that the remote sensing team in oceanic study in China already has a considerable base. In the future, we must concentrate on applied research, in addition to strengthening fundamental studies, in order to contribute to the national defense and the economy. The following tasks are recommended in future work:

1. Study of Ocean Wave Characteristics

The basis for the qualitative interpretation and quantitative extraction of ocean information from pictures is the characteristic wave pattern. Statistical models are widely used in the world. They were established under specific atmospheric and sea conditions and are applicable in such conditions. Therefore, models established by foreign scholars may not suit the situation in China. We should build a more accurate physical model to suit the specific atmospheric and ocean conditions for the Chinese coast in order to facilitate the extraction of information directly from remote sensing.

2. Study of Fishing by Remote Sensing

The U.S. and Japan have received significant results in directing fishing by remote sensing. We should investigate the relation between different kinds of fish and various environmental factors. Remote sensing methods can be used to measure various environmental factors to provide real time, useful information for the fishing industry.

3. Monitoring the Ocean Environment

According to both domestic and foreign literature, ultraviolet and infrared photography and microwave radar have already been successfully applied to the monitoring of oil pollution. Visible and infrared pictures can detect the polluting source to provide the information on the diffusion of polluted water from cities and fields in the rivers, lakes and oceans. We should initiate work in this area so that the corresponding countermeasures against ocean pollution can be taken as we exploit the ocean.

4. Detection of Wind, Wave and Current

As an international trend, the U.S., Europe, Japan and Canada are paying attention to the detection of wind, wave and current on the surface of the ocean. They are actively developing sensors such as microwave radiometers, scattering meters and altimeters. We should be alerted to grasp this technology early for defense and civilian applications.

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12553
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APPLIED SCIENCES

ORGANIZING GEOLOGICAL WORK TASKS FOR 1935 OUTLINED

Beijing ZHONGGUO DIZHI [CHINA GEOLOGY] in Chinese No 2, 13 Feb 85 pp 1-4

[Article by Wen Jiabao [3306 1367 1405]]

[Text]]

Conscientious adherence to the spirit of the State Council for reforms in economic systems and earnest implementation of the spirit of the National Conference of Geology Bureaus and the decisions of the Ministry of Geology and Mineral Resources concerning expansion of the decision-making rights of geology teams and reforms in economic management during 1984 motivated the initiative of all employees. They are striving to exploit potentials, doing a lot of work and paying attention to economic results. They have completed and surpassed geology work plans. The geological achievements are obvious and all lines of work have achieved a certain deal of success.

1. There have been prominent achievements in geological mineral exploration. There have been major breakthroughs in oil and gas surveys and the first high-yield oil and gas well in China has been drilled in the northern part of Xinjiang's Tarim Basin. In the area of solid minerals, more than 100 large and medium-sized mineral deposits have been found. More than 100 large and medium-sized mineral deposits for sampling have been found and more than 150 new mineral deposits have been discovered. All quotas for the 23 types of newly-increased mineral reserves contained in plans have been surpassed. Plans have been surpassed in all types of basic regional work including 1:200,000 scale regional geological surveys (an area covering 13,000 km^2 was completed), 1:50,000 regional geological surveys (an area of 43,000 km^2 was completed), hydrogeological surveys and regional gravity surveys.

2. A group of important achievements have been made in geological surveys and hydrogeological engineering surveys around key state construction projects and the coastal cities and special economic zones open to foreigners. In 1984, 18 geological survey reports on key projects included in state construction plans during the Sixth Five-Year Plan and preliminary work plans for capital construction were submitted. Water resource surveys and engineering geology data for the energy resource and heavy and chemical industry base area centered on Shanxi and for Shanghai and other important economic zones were submitted. Moreover, more than 10 large-scale water resource areas are being explored in central [major] cities.

3. Fairly good results have been obtained in geological scientific research. In research on coal gas, industrial gas flows have been obtained in four areas from three strata systems. There have been new discoveries in research on gold ore. Obvious progress has been achieved in research on exploration methods for oil and gas in the carbonatite rock of southern China. Fairly good economic results have been achieved in determining the reserve capacities of underground water-bearing strata in Shanghai and in drilling. A group of prospective mineral regions have been provided for the Nanling project.

There have been new developments in economic and technical exchange and cooperation with foreign countries and we have increased broad-based exchanges between Chinese and foreign geologists. Very significant progress has been made in the Sino-Japanese Geological Team and the Sino-West German cooperative project in the Guangning region. Shenzhen and other areas are now actively organizing the opening up to the outside and are playing a role as portals.

4. Major achievements have been made in geological education work. There were 60 masters students and more than 3,600 college and polytechnical school graduates who took up posts in 1984 to strengthen the geological ranks. Some 21,000 employed cadres were trained. Rotational training and training work for technical and young workers also is proceeding well and 22 technical colleges have resumed recruiting students. The levels, specifications and structure of specializations in schools were readjusted in 1984 and trial reforms in management systems and education now have begun.

5. Some 3.23 million meters of exploratory wells were drilled in 1984. This was the most work completed in a single year over the past 4 years and a 16 percent increase over 1983. Engineering quality also has improved. In tunnel drilling work, 81,000 meters were completed, 22 percent more than in 1983.

All bureaus are striving to exploit potentials in order to achieve and do more. Under conditions of inadequate state budgetary allocations, we have mobilized almost 30 million yuan of surplus capital and more than 17 million yuan of our own capital to do more work. This is a situation seldom seen in recent years.

6. Capital has been absorbed from society and the range of services has been expanded. Obvious results have been achieved in providing construction services to the state and local areas. In order to satisfy the needs of national economic construction and all aspects of society, urgently-needed services for key state and local construction projects were improved over the past year and many bureaus are actively developing contractual geological work with related units. According to preliminary statistics, about 90 million yuan in social capital was absorbed for carrying out specific contractual responsibility for geological work and about 350,000 meters of exploratory drilling work were completed. Work being done under contract has expanded from drilling water wells, engineering wells and labor services of the past to surveys and prospecting for solid minerals, geological surveys of hydro-geological projects, all sorts of geological technical consulting, compensated leasing of data on geological achievements, geological exploration work in cooperation with foreign countries and other areas. This has opened up a broad market for geological work and increased the vitality of geology teams.

7. Completion of investment plans for fixed assets in 1984 was one of the best years. This is most evident in the rapid pace of local construction and the high rate of project completion. The amount of construction arranged for geology team base areas in 1984 also was the most in recent years. About 600,000 square meters of employee residences were completed.

8. With a prerequisite of concentrating on reorganization, enterprise reform and technical progress, all manufacturing plants have completed and surpassed industrial production plans. In 1984, some 108 percent of the annual plan for industrial value of output was completed, up by 15 percent over 1983. Work on development of new products has progressed rapidly and developments in activities to raise product quality and grades have been good.

II

The year 1985 is the final year of the Sixth Five-Year Plan and also is the year of preparation for the Seventh Five-Year Plan. Conscientious arrangements and implementation of the plan for 1985 will play an extremely important role in guaranteeing continued development of geological work and better service to national economic construction.

In 1985, we must conscientiously adhere to the principles of the CPC Central Committee concerning enlivening the economy and opening up to the outside and actively but safely promote reforms in geological work systems. Make breakthroughs in key areas, make arrangements with consideration for all factors, complete and surpass all work tasks specified in the Sixth Five-Year Plan and make good preparations for national economic construction and developing geology work during the Seventh Five-Year Plan.

1. Make breakthroughs in key points, make overall plans with consideration for all factors, make good arrangements for the 1985 plan and strive to achieve better results in geological mineral exploration.

In the area of the tasks of geology work:

1) Continue to give primacy to energy resource geological work. Geological work related to petroleum and natural gas should focus on oil and gas surveys in the northern part of Xinjiang's Tarim Basin and offshore areas in the East China Sea. At the same time, we also should continue to strengthen work on natural gas (coal-bearing gas) in the Ordos, North China and Sichuan regions and on carbonatite regions in the south and strive for breakthroughs. Geological work in coal fields should combine guaranteeing geological exploration in key construction projects with surveys on coal field surveys in favorable regions in eastern China and surveys of the prospects for China's coal resources. Geological work on uranium ore should focus on rich ore and large deposits and strengthen surveys and mineral exploration in important mineralization regions in northern Guangdong and northern Sichuan.

2) Make active arrangements for surveys of ferrous and non-ferrous mineral deposits and assure the completion of key projects and exploration tasks for specific mineral regions. Continue to strengthen work on gold, copper, tin,

aluminum, zinc, boron, diamonds, phosphorous, sulfur, and other primary light consturction materials. At the same time, we should do good work in exploration for ore in key zones of prospective mineralization and further expand their scope. We should focus on geological work on minerals in the coastal cities open to foreigners and special economic zones. We must stress completion in 1985 of the part of solid mineral reserves plans stipulated in the Sixth Five-Year Plan that has not been completed.

3) Further strengthen hydrogeological engineering and environmental geology. We should actively develop hydrogeological engineering geology and environmental geology work in the 14 coastal cities open to foreigners, the four special economic zones, in central cities with a focus on the capitals of provinces and autonomous regions, and in Shanghai, Shanxi, the northeast, Beijing, Tianjin, Tangshan, and other important economic regions. Energy resource communications projects should be the focus of doing good work in geological surveys for hydrogeological engineering in key construction projects and important industrial base areas and agricultural and animal husbandry base areas. There should be a focus on developing environmental background value surveys and environmental engineering geological surveys along primary rivers and communications trunklines.

4) Make key zones of prospective mineralization and the open cities and central cities the focus for good work in basic 1:50,000 geological surveys (hydrogeological engineering geological surveys and geophysical and geochemical surveys at a sizeable scale). Continue to adapt to local conditions in accelerating regional geological surveys, regional hydrogeological surveys, regional gravity surveys, regional geochemical prospecting, high-precision aerial geophysical surveys and other basic geological surveys as required by the related plans.

In geological scientific research work, we should continue to adhere to the principle of orientation toward economic construction and geological mineral exploration. We should focus on solving key problems in mineral exploration surveys, exploration technologies and methods and experiments on ore processing technologies and we should firmly grasp key breakthrough projects and other key projects of the state and the ministry. We should strengthen comprehensive research as required by contracts and do good work in evaluating and transforming achievements. We should actively do good work in implementing trial reforms in compensated contract systems and scientific research funding systems and trial reforms in laboratories.

2. Widely absorb social capital, do more work and meet the needs of national economic construction and all aspects of society and strengthen the vitality of geology teams. In order to make full arrangements for the 1985 plan and enable both types of capital to play a full role, all bureaus should place a special focus on absorbing social capital, expanding the range of services and doing more geological work. We should integrate closely with the needs of national economic construction and, on the basis of guaranteeing key points, sort through geological work projects to drop those projects where work has gone on too long, where the scale is too small or where the prospects are not ideal. We should muster our strengths and develop specific contractual

responsibility for the geological work projects urgently needed by the state and local areas. All bureaus and teams should organize experts to collect data, strengthen their connections with local areas, actively develop the profession, do good work in adminstration and management, open up a new situation, gain prestige and corner markets.

3. Fully exploit potentials, make good arrangements for geological exploration plans. If we wish to make the best arrangements for our limited budgetary allocations and strive to use the smallest amount of investments to achieve the most possible geological results, we first of all must have good reforms and use reforms in planning systems and in all areas of management and administration to further expand the decision-making rights of grass-roots units, strengthen the vitality of geological teams and encourage the masses of employees. We should use various forms of economic responsibility systems focused on contractual responsibility to improve work efficiency and work quality and conserve on investments. All bureaus and teams should fully exploit their inner potential and mobilize all internal resources, pay attention to conservation, overcome waste and do more work. In a macro perspective, we should pay attention to economic results, and in a micro persepctive, we should focus on precision and accuracy.

There should be strict limits on the number of personnel and groups. Increases in the number of employees should be controlled and staffs should be small and highly trained. Old and weak employees who are not suited to work at the frontline should be organized to develop technical advisory services and develop a "second industry" for gradually making them capable of being self-supporting. Whenever the conditions are appropriate, there should be ownership by the whole people, management by the collective, independent accounting and responsibility for profits and losses to reduce the burden on the state.

4. Make good arrangements in fixed assets investment plans. The focus of investment utilization for capital construction in the area of technical equipment in 1985 is to update and outfit the equipment and instruments in all geology team labs. We should continue to supplement and renew oil and gas survey equipment and even import some advanced technical equipment for well control and monitoring and for monitoring weak links in wells for use in deep drilling for oil and gas. We should import a group of large-scale precision instruments for the central laboratory facilities. There should be increased numbers of computers as appropriate with a focus on using them for geophysical and geochemical prospecting. We should continue to do good work in updating and transforming well and tunnel drilling equipment. We should increase the number of some coal field mine monitoring instruments, shallow seismographs, gravitometers, laser devices, and other geophysical propsecting instruments.

The investments used for capital construction will be greater than in 1984 to gradually solve the housing problems of field team employees.

5. Do good work in all areas to meet the daily needs of developing geological work. Geological educational departments should conscientiously adhere to the decisions of the CPC Central Committee concerning reforms, do good work in educational reforms, encourage all employees to run the schools well and improve the quality of education.

We should further liberate our ideas and, with a prerequisite of being unified in dealing with outside [foreign countries], strive to develop many channels and many forms of economic and technical exchange and cooperation with the outside. We should actively strive to gather foreign capital assistance from all sources and gradually change normal scientific and technical exchanges to cooperative research on key projects, and we should fully absorb and utilize foreign capital.

We should do good work in collecting and studying foreign scientific and technical information on geology and serve geological mineral exploration and scientific research work.

There should be comprehensive development of supervision and management work on mineral resources in 1985. We should make good preparations for the promulgation and implementation of the National Mineral Resources Law. We should continue to focus on formulation of a system of laws and regulations for management of mineral resources, and we should grasp mining survey and research work.

6. There should be continued good work in economic reforms in enterprises that produce geological machinery and instruments. The vitality of the enterprises should be increased, and we should strive to improve the quality of enterprises and raise economic results. We should improve administration and management and actively develop the "second industry." Units operating at a loss should be eliminated during 1985. We should focus on product quality and actively do good work for raising product grades and technical development.

Fairly major achievements were made in geological work during 1984, but there still are many problems in our work. During 1985, we should conscientiously implement the decisions of the 12th CPC Central Committee concerning reforms in economic systems, seek truth from facts, closely integrate with the realities of geological work and speed up the pack of reforms in geology work systems. We believe that we certainly will be able to create a new situation in the ministry in all areas if only we work creatively in accordance with the spirit of CPC Central Committee documents.

12539
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APPLIED SCIENCES

REVIEW OF, OUTLOOK FOR GEOLOGICAL WORK IN SHANXI

Beijing ZHONGGUO DIZHI [CHINA GEOLOGY] in Chinese No 8, 1984 pp 6-8

[Article by Shen Yonghe [3088 3057 0735], Shanxi Provincial Mine Bureau]

[Text] Our great socialist homeland has experienced 35 years of glorious struggle, all the people of all nationalities in China rally close together around the CPC Central Committee, and, under the guidance of the line adopted at the 12th Party Congress they are striding forward toward the magnificent goals of the four modernizations. Those many geological workers doing combat in the arena of China's energy resources, heavy and chemical industry have reviewed the 35 years' accomplishments of geological work in Shanxi and look forward to a glorious future by the year 2000. Imbued with ever more confidence, we will struggle to effect the great goals put forth by the 12th Party Congress.

Geological work began in Shanxi province in the latter part of the 19th century, and by 1932 a geological investigation structure was formed. In the 80 years before liberation, although some investigative work was done on coal series beds and Precambrian series at Wutai Shan, the level of both geological work and geological study was rather low. With the concern and leadership of the CPC and the peoples' government, Shanxi province's geological work has achieved rapid growth in only 35 years. Today Shanxi has assembled a multi-disciplinary geological work force with modern equipment that is quite up to par. In 35 years the many geological workers of Shanxi have labored assiduously to reap rich results for China's socialist construction.

By the end of 1979, a 1:200,000 regional geological survey of 156,000 square kilometers had been completed and a 1:50,000 regional geological survey had begun. By means of a systematic summing-up it was possible to establish the succession of strata for each geological age in Shanxi, and, utilizing various aspects of geotectonic theory, the laws of geological development were set out, the characteristics of the igneous rock of each geological age were probed, demonstrations of the subordinated relationships of magmatic rock to mineral-forming activities were made; all these advancing the cause of the development of prospecting for minerals.

As a result of 35 years of geological reconnaissance surveys and prospecting 6.8 million meters of test holes have been bored, over 2,000 reports have been written, providing the source for 44 minerals in over 600 locations.

The provincial 1:200,000 hydro-geological survey is complete. The development of survey work for the providing of water for farms, cities, and industries has guaranteed sufficient groundwater reservoir quantities for important cities and regions, encompassing a large area suited to well drilling. The creation of hydro-geological charts in 1:500,000 scale for the whole province, with some areas in 1:200,000 scale, has resulted in suggestions for the development and utilization of the water resource.

In recent years work in engineering geology and environmental geology has developed apace. With a base line running from Zhongyinhuang [Central Huan He Diversion] to Beiyinhuang [North Huang He Diversion], important material on the pollution of the cities' groundwater, and environmental protection, as well as the occurrence and prevention of local disorders has been produced.

Aerial physical exploration over a large area, and surface physical surveys on different scales have produced important bases for predicting mineralization and for guiding a mineral prospecting. On the basis of the 1:200,000 provincial chemical exploration surface sweep, 1:500,000 geochemical maps have been produced for these four elements: copper, chromium, nickel, and cobalt, highlighting over 900 anomalous multi-element areas. This is of great significance in the resolution of regional geochemical characteristics, and in guiding reconnaissance surveys and mineral surveys.

Attention has been paid to importing new equipment, techniques, and technologies in the area of mineral prospecting and assay methods. Clear accomplishments have been made in test weel engineering and mineral assaying.

Shanxi's geological workers have emphasized scientific studies in geology and have produced a series of important charts, including: 1:500,000 geological maps (second generation), 1:500,000 tectonic system maps, etc. We have also completed work on iron, copper, gold, aluminum, phosphorus, and sulfur districts. We have published "Tables of Shanxi Strata" [Shanxi diceng biao] and completed a 1:200,000 regionao reconnaissance summary.

Important results have been realized in geological scientific research across to province; in provincial coal reconnaissance and study; in the conducting of analysis of the conditions of sylvite and metamorphic iron ore.

Moving out from the basic mission of the construction of energy resources, chemical, and heavy industrial bases, the geological workers of Shanxi, with the goal of ever-better satisfying the needs of establishing and developing the people's economy, have confronted even more arduous tasks.

The 1:200,000 regional geological reconnaissance data is not enough to satisfy the need of the future establishment and development of the people's economy; the 1:50,000 regional geological reconnaissance of mineral-forming areas (zones) has only been completed for 2.5 percent of the province's total area; the work on 1:50,000 regional reconnaissance for important economic construction zones and important cities and environs has only just begun.

Although over 600 places have been entered into the list of places with minerals in equilibrium reserves, the level of work has been low, and the utilization ratio is not high. In order to make Shanxi into a base for energy resources, heavy and chemical industries, a great deal of geological work must still be done, as there are still gaps in the minerals available. Shanxi's water resource is not extensive; in the past it was felt to be insufficient. Therefore, solving the problem of water sources for the construction of Shanxi's energy resource, heavy and chemical industry bases, is a matter of the utmost urgency and importance.

In light of the above conditions, the guiding principle for Shanxi's geological workers must to closely revolve around the energy resource, heavy and chemical industrialization of this center. In order to do this, we:

1. Must continue to augment the 1:50,000 regional geological reconnaissance work. At the same time as diligently finishing the 1:50,000 regional reconnaissance of mineral-forming areas, we must also increase the development of 1:50,000 regional reconnaissance work for important economic areas and important cities and environs, to achieve the program concept of having 35 percent of the province surveyed by the year 2000.

2. Must take coal, aluminum, copper, and sulfur as the key points on the mineral resource side. We must do all we can to provide several construction bases, to guarantee the Seventh 5-Year Plan, and to meet the needs of the development of the people's economy in the next 10 years. By 2000 the amount of precisely identified coal reserves must be increased by at least 30 billion tons. While exploring and prospecting for coal at the same time we must work on an appraisal of the coal formed gas and other paragenetic minerals. We must concentrate on finding good mines in the vicinity of mines now being exploited. Appropriate arrangements must be made for gold, phosphorus, and mirabilite ores as well. In sum, we must provide the requisite needs of production and construction in a timely manner.

3. Must be able to make predictions of water quality, quantity, and location in order to solve the water supply problem for the key construction projects by the year 2000. We should provide a basis for environmental protection. We must increase engineering geology work, in order to provide a reliable scientific background for the Huang He-Shanxi-Beijing Diversion Project, the renovation of our land, and the construction of our cities.

4. Must continue to increase our general studies, strive to increase our understanding of the geological principles of our province, to accumulate

the geological data that will be required by the next 10 years' geological engineering for ground breaking development. We must stress the importation of and expanded use of new techniques, technologies, and methods, and increase the speed and quality control of every aspect of geological work, in order to accomplish every goal on time and within quality limits. In the next 16 years, every aspect of geological work in Shanxi will double. The products of geological work, especially the reserves of mineral resources sorely needed for energy resources and the construction of heavy and chemical industry, will be increased. The level of research work in geology will be raised, and there will be a new beginning in the future of geological work.

Since the 3d Plenary Session of the 11th party Central Committee, the correct line, principles, and policies of the party have permeated men's hearts, and reorganization of the system has resulted in the replacement of old cadre with new, breathing a fresh breath into geological activities with cadres who are more revolutionary, younger in average age, better educated and professionally more competent. The work of party rectification is making progress in improving the cadre work style, and the party leadership is improving and increasing this work. We truly believe that under the correct leadership of party Central Committee and every level of party committee, summarizing experience, overcoming shortcomings, carrying forward our successes, advancing bravely, we must certainly be able to victoriously achieve our objective.

12663
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APPLIED SCIENCES

SYNTHETIC APERTURE SIDE-LOOKING RADAR IMAGE ADJUSTMENT

Shanghai GUANXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 4 No 8, 1984 pp 756-759

[Article by Yuan Huikun [5913 1979 0981] of the Institute of Electronics of Chinese Academy of Sciences: "Adjustment of Image Geometry Error for Synthetic Aperture Side-looking Radar"]

[Text] Abstract: The cause of image geometry error of synthetic side-looking radar is introduced and the principle of wedge lens correction is analyzed in this paper. Wedge lenses are used to correct the image geometry error of the image of a side-looking radar which resulted in a more accurate radar image.

In synthetic aperture radar data processing, an optical information processing technique has been successfully employed. The capability of optical information processing to handle a great deal of computations and its low cost are fully demonstrated. In recent years the side-looking radar data is usually processed by a bevel optical processor [1] and high resolution radar images have been obtained.

Side-looking radar data is two-dimensional. In bevel optical processing only the directional signal is corrected by the cylindrical lens telescope of the processor. However, there is no correction made with regard to the range. There, the radar image thus obtained has some geometry errors. It is necessary to correct these geometry errors in order to get an accurate image of the target.

I. Estimation of Image Geometry Error

A side-looking radar transmits a slightly inclined microwave beam toward the ground target, as shown in Figure 1, and receives the return signal to generate data by coherent recording. Its direct range (Rt) can be expressed as follows:

$$R^2(t)=\left[vt+v_t t-\frac{1}{2}a_t t^2\right]^2+\left[R_0-v_r t-\frac{1}{2}a_r t^2\right]^2,$$

where v_r, a_r, v_t, a_t are the velocities and accelerations of the ground targets, Ro is the ground distance, v is the velocity of the aircraft and t is time. On the radar display, only the direct distance of ground targets are recorded which causes a compression effect to lead to geometry error of the radar image. In Figure 1, H is the altitude, R2 is the maximum direct range, R1 is the

minimum direct range, Rt is the direct range, θ is the pitch angle of the radar, and Ro is the ground distance. From the geometry of the radar operation we get that Ro=Rtcos. Hence, the geometry error Δ is

$$\Delta = (R_t/R_0) = (1/\cos\theta)_0$$

If θ+=25° and θ_2=15°, Δ_t=1.103 and Δ_2=1.035. Based on Δ_1, its geometry error could reach approximately 10 percent. If R1=25 km, the geometry error might be 2.5 km. The target would be distorted on the image. In order to eliminate this distortion, a wedge lens magnifier was used to correct the geometry error of the radar image.

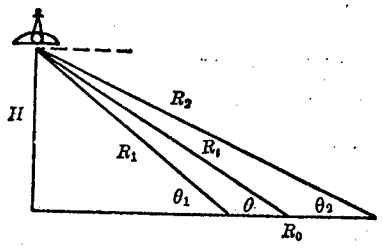

Fig. 1 Side-looking radar system geometry

II. Wedge Lens Adjuster

1. Magnifying Principle of a Single Wedge Lens

A parallel light beam, W_{in} in width, incidents on the vertical surface of a wedge lens (as shown in Figure 2). The light is transmitted through the wedge lens and becomes a beam whose projected width is W_{out}. Due to the fact that W_{in} W_{out}, the wedge lens has a compressing effect. The compression factor Ko can be calculated from the geometry shown in Figure 2:

$$K_\theta = (W_{出}/W_{入}) = \cos(\theta+\alpha)/\cos\theta_0 \qquad (1)$$

On the other hand, if the parallel beam enters from the slanted side of the wedge lens, the lens has a magnifying effect. Therefore, this lens can make geometry corrections. However, a single lens has one refraction angle θ. Its magnifying factor is a constant. Therefore, a single wedge lens is not suited for the correction of geometry errors of radar images.

2. Wedge Lens Magnifier

From the above, we know that the geometry error of the side-looking radar varies in a certain range. A pair of wedge lenses were used to form a magnifier. The magnification index K_θ can be varied by rotating the relative angle between the two lenses. In the configuration shown in Figure 3(a), K_θ =1. In Figure 3(b), the value of K_θ can be calculated from eq(1), as listed in Table 1.

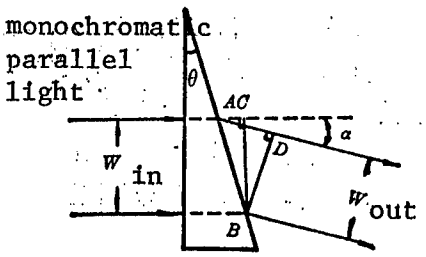

Fig. 2 Geometry of Wedge-lens system

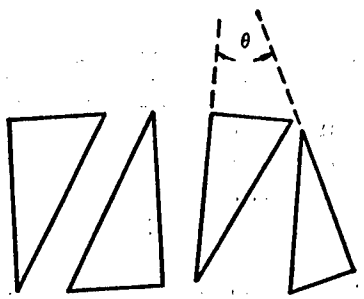

Fig. 3 Geometry of correcting principle of wedge-lens system
(a) K_θ=1 without; (b) Adjustment state

Table 1. Relationship of Amplifying Factor K_θ With Rotation Angle θ

θ(度) degree	K_θ	θ(度) degree	K_θ
0	1	12	1.0384
2	1.001	15	1.0626
4	1.004	16	1.0729
5	1.006	18	1.0976
8	1.0162	20	1.1273
10	1.0256		

In designing a wedge lens magnifier, we should note that: (1) In a parallel monochromatic light beam, achromatization of the wedge lens can be neglected;

(2) The refractive angle should not be too large in selecting the wedge lens. In addition, optical glass with a relatively small index of refraction n should be chosen as the material;

(3) The angle of rotation of the wedge lens magnifier should not be too large. Moreover, the light passing area of the magnifier should be large enough to ensure radar data transmission.

III. Correction Experiment for Geometry Error of Side-looking Radar Image

A 1:1 image was formed on the image film from the focal plane of the data film. The three cylindrical lenses, L3, L4, and L5, formed an azimuth telescope whose magnifying factor is 1/K (K is the azimuth ratio of the radar). It simultaneously tilts the data film and the image film by an appropriate angle so that the range image and the baaring image can be superpositioned on the film. Because the azimuth telescope reduces the azimuth direction of the image by a factor K, the final images become identical. A tilted-plane optical processor is usually used to process the data collected by a side-looking radar (as shown in Figure 4). The laser emits a monochromatic coherent light beam which is then expanded, filtered and collimated to become a large diameter, homogeneous, parallel beam

shining on the data film of the side-looking radar. In the meantime, a range telescope, comprised of spherical lenses L1 and L2 of the same focal length, will synchronously move the data film and the image film to obtain the continuous radar image.

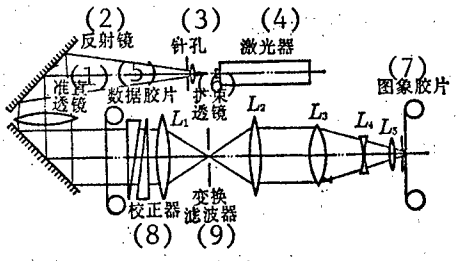

Fig. 4 Tilted-plane Optical Processor

Key:

1. Collimating lens
2. Reflective mirror
3. Pinhole
4. Laser
5. Data film
6. Beam expanding lens
7. Image film
8. Correction device
9. Filter

2. Correction System for Geometry Error of Radar Image

In a tilted-plane optical processor, a 1:1 image in the range direction is formed on the image film without correcting for any geometry error. To place the wedge lens magnifier in front of the spherical lens L1 and behind the radar data film in a tilted-plane optical system (as shown in Figure 5) will require the readjustment of the relative position of the optical processor. In the correction process, the relative angle between the two wedge lenses is adjusted based on the value of the geometry error of the image. Because the functional error, or Rt is non-linear, it is impossible to accurately correct the error by using the wedge lens magnifier. Various corrected images may be obtained by making corrections with respect to the maximum and minimum errors of R(t) in segments, or by using the average.

3. Experimental Parameters of Wedge Lens Adjustment System

A wedge lens correcting device was designed based on the requirements of side-looking radar data in the experiment. Its parameters are:

Radar Data Transmission Area, S = 100 mm x 80 mm; Geometry Error Correction Factor $K\theta$ = 1 - 1.25; and Relative Angle of Rotation of Wedge Lenses $\theta = \theta° - 30°$.

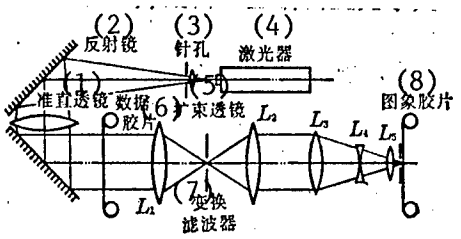

Fig. 5 Adjustable System of Radar Image Geometry Error

Key:

1. Collimating lens
2. Mirror
3. Pinhole
4. Laser
5. Beam expanding lens
6. Data film
7. Filter
8. Image film

Figure 6 is a more precise image of a side-looking radar obtained by mean value correction. Image distortion was improved and target precision was also increased.

Comrades Zhang Chengbo [1728 3397 3134], Song Jiajun [1345 1367 7486], Ye Huaqiang [0673 5478 1730] and Yang Ruliang [2799 3067 5328] rendered their assistance in the design of the wedge lens correction device for geometry error in radar images. Associate Professor Wang Minqiang [3769 3046 1730] of the Department of Precision Instrument of Qinghua University offered guidance in the optical design of the wedge lens adjuster. The author wishes to express his gratitude to them.

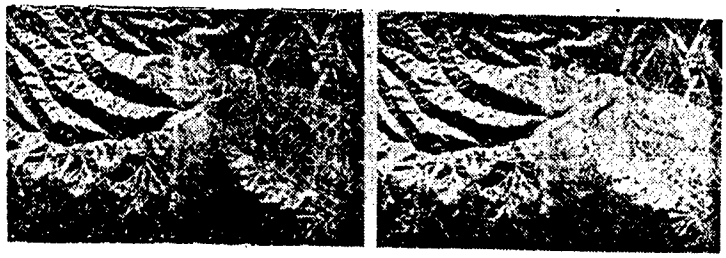

Fig. 6 SALR Image
(a) Without correction; (b) With correction

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12553
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APPLIED SCIENCES

NEW IMAGE DEBLURRING METHOD DESCRIBED

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 1, 1983 pp 1-9

[Article by Yang Guoguang [5107 0948 0342] of University of Science and Technology of China and E. N. Leith of University of Michigan: "A New Image Deblurring Method"]

[Text] Abstract: An incoherent image deblurring method was developed. A new deblurring function, which is easier to implement than an inverse filter, was employed. This function, when convoluted with a blurred image in the spatial domain, can result in a deblurred image. This system is applicable to both extended monochromatic and white light sources. Because of the use of incoherent light sources, it introduced some redundancy. As compared to a conventional coherent light system, this method significantly improves the signal to noise ratio of the output image. Theoretical analysis proved that this new deblurring function is the Fourier transform of the inverse filter function. Experimental results were also presented.

I. Introduction

The inverse filter method is usually used for image deblurring. The process of image blurring due to linear motion can be described by the following pulse response:

$$r(x) = \mathrm{rect}(x/l), \quad \mathrm{rect}(x/l) = \begin{cases} 1, & |x| \leqslant l/2 \\ 0, & \text{otherwise}, \end{cases} \tag{1}$$

where l is the effective blurring length. The corresponding transfer function is

$$R(f_x) = l \sin c(l f_x), \quad \sin c(x) = \sin \pi x / \pi x_0 \tag{2}$$

Let us assume that s(χ), u(χ) and r(χ) are the pulse responses of the original image, the blurred image and the blurring process, respectively, then u(χ) = s(χ) ⊛ r(x) where ⊛ is the convolution operation. The corresponding Fourier transform can be expressed as V(fx) = s(fx).R(fχ). The restored image $\hat{s}$(x) follows the formula $\hat{s}$(χ) = u(x) ⊛ h(χ), where h(x) is the pulse response of the deblurring filter. Its corresponding Fourier transform is $\hat{s}$(fx) = V(fx).H(fx). Ideally, $\hat{s}$(χ) = s(χ). Hence, the ideal deblurring filter function is:

$$H(f_x) = [R(f_x)]^{-1} = [l \sin c(l f_x)]^{-1}, \qquad (3)$$

This is the inverse filter.

When this inverse filter is used to restore the image, two major difficulties are encountered. First, this inverse filter is difficult to fabricate. Because the function R(fx) has periodical zeroes, the filter has infinite number of poles. For this reason, any approximation of the inverse filter must have a very high dynamic range which is impossible for the photographic film. Usually this filter is composed of amplitude and phase components and known as a "sandwich filter." It is difficult to fabricate. The other problem is that the inverse filter is a high-pass filter because most of the high frequency components are lost in the deblurring process and must be reinforced in the restoration process. Therefore, any high frequency noise or optically generated noise will be significantly amplified. In the meantime, it is impossible to avoid the diffused spot noise introduced by the laser light source. Therefore, it is difficult to improve the signal to noise ratio of the output image.

Zhuang Songlin [8359 2646 2651] and Yang Zhenhuan [2799 7201 1403][1] reported a method to deblur images by a white point light source to reduce noise. They used a diffraction grating to disperse the white light to various spectral components. These components travel through different paths in the optical system. Thus, a certain degree of redundancy is introduced in the system to suppress noise. Goedgebuer et al[2] reported a similar method in which a prism was used to disperse the light.

We developed a new method[3,4,5] to overcome the aforementioned problems. We noticed that the Fourier transform of the inverse filter function is a simple function in the spatial domain. The deblurring function can be easily implemented optically. Moreover, an incoherent light source may be used in this system. Thus, the signal to noise ratio of the restored signal can be significantly improved.

II. Theoretical Analysis

Leith[3] had presented an image deblurring method to convolute the blurred image and the deblurring function in the spatial domain. The deblurring function used can be expressed as

$$h(x) = \text{sign}(x) \sum_{n=-N}^{N} \delta^{(1)}[x - (n - 1/2)l], \qquad (4)$$

where $\delta^{(1)}(x)$ is the derivative of δ and sign (x) = $\begin{cases} 1 & x > 0 \\ 1, & x < 0. \end{cases}$

Figure 1 explains the h(x) $\circledast$ u(x) convolution in the deblurring process.[6] The width of the blurred image, 1, is a rectangular function. It represents the width dispersion 1 caused by the linear motion of a linear object. It is easy to see that the result of the convolution operation between h(x) and u(x) is the pattern shown on the bottom of Figure 1, which is a strong pulse and two weaker pulses. Thus, we get an intense deblurred image and two weaker deblurred images. If N is sufficiently large, these two weaker images will fall outside the pattern. Equation (4) is called the A-type deblurring function.

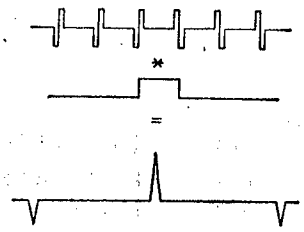


Fig. 1 Convolution Operation of Using Type-A Deblurring Function

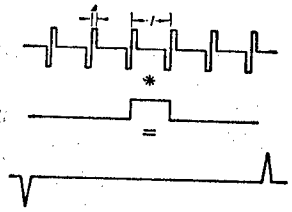


Fig. 2 Convolution Operation of Using Type-B Deblurring Function

There is another similar deblurring function (the B-type) which can be expressed as:

$$h(x) = \sum_{n=-N}^{N} \delta^{(1)}[x-(n-1/2)l], \qquad (5)$$

The convolution operation of this function is shown in Figure 2. Apparently, it gives two identical deblurred images.

From the viewpoint of inverse filter operation, there is another explanation as the one shown in Figure 3. The product of the Fourier transform of the blurred image of a linear object and the inverse filter function in the frequency domain is a constant. Then, it is a δ function in the spatial domain, which is the deblurred image.

The question is "What is the relation between convolution and inverse filter operations?" In other words, we are going to find the relation between the inverse filter function and the deblurring function.

First, let us calculate the Fourier transform of the inverse filter function:

$$g'(x) = \mathscr{F}^{-1}\{H(f_x)\} = \int_{-\infty}^{\infty} \frac{\pi f_x}{\sin \pi f_x l} \exp(i2\pi f_x x)\, df_x, \qquad (6)$$

The integration has infinite poles on the real axis. They are fx = n/1, where n = $\pm$, $\pm$2,----. By generalized integration, equation (6) becomes

$$g'(x) = \operatorname{sign}(x) \cdot \left\{ -\frac{4}{l^2} \sum_{n=1}^{\infty} (-1)^n n \sin \frac{2\pi n}{l} x \right\}, \qquad (7)$$

If n is infinite, the series is divergent. Because it is impossible to make a filter with infinite poles, usually only the first several orders, such as N = 3 or 5, are used. Hence, the approximate expression for equation (7) becomes:

$$g(x) = \operatorname{sign} \cdot \left\{ \frac{4}{l^2} \sum_{n=1}^{N} (-1)^n n \sin \frac{2\pi n}{l} x \right\}. \qquad (8)$$

On the other hand, the Fourier series of h(x) can be expanded from equation (4). If we define $f(x) = \sum_{n=-N}^{N} \delta^{(1)}$ [x-(n-1/2)1], this equation can be rewritten as

$$F(f_x) = \mathscr{F}\{f(x)\} = 2\pi i \sum_{n=-N}^{N} f_x \delta(f_x - n/l) \exp(-i\pi f_x l), \tag{9}$$

It is easy to prove that

$$f(x) = \int_{-\infty}^{\infty} F(f_x) \exp(i2\pi f_x x)\, df_x$$

$$= -\frac{4}{l^2} \sum_{n=1}^{N} (-1)^n n \sin \frac{2\pi n}{l} x, \tag{10}$$

Therefore

$$h(x) = f(x) \cdot \operatorname{sign}(x) = g(x) = \mathscr{F}\{R(f_x)\}. \tag{11}$$

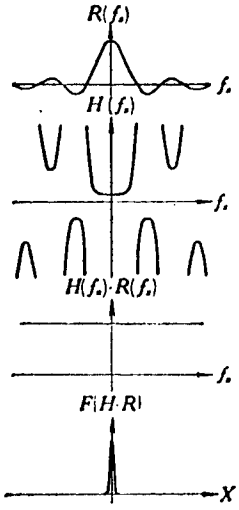


Fig. 3 Inverse Filtering Operation

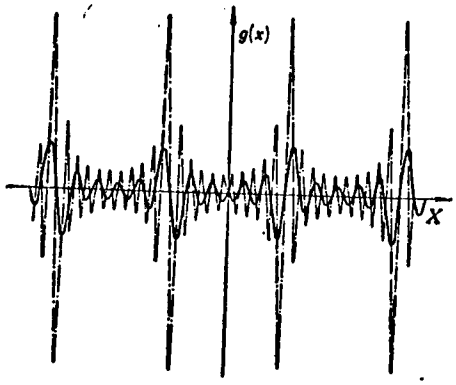


Fig. 4 Schematic Diagram of Function Function g(x)

We can see that the deblurring function h(x) is the Fourier transform of the inverse filtering function H(fx). Therefore, the convolution operation in space is equivalent to the filtering operation in the frequency domain.

Figure 4 shows the schematic diagrams of g(x) when N = 5 (solid line) and N = 10 (dotted line). As an approximation, the deblurring function (5) can be expressed as

$$h(x) = \sum_{n=1}^{N} \left[\text{rect}\left(\frac{x-nl}{\Delta}\right) - \text{rect}\left(\frac{x-nl-\Delta}{\Delta}\right)\right], \qquad (12)$$

Here, the δ function is expressed as a rectangular function width in approximation.

An incoherent light source is usually an extended light source or a white light source. For an extended light source, each small element corresponds to a channel. For a white light source, because of the presence of a dispersion element (such as a grating), different wavelength passes through a different channel. In this case, the output is an incoherent superposition of different channels. Because the output signals from various channels are correlated while the noise signals are not, the resulting output signal is reinforced while the noise is averaged out. Therefore, a certain degree of redundancy is introduced by using an incoherent light in the optical system. The signal to noise ratio is significantly improved. If there are N independent information channels because of the introduced redundancy, then it can be accurately proved that the signal to noise ratio can be improved N times.

III. Implementation of the Deblurring Operation and Experimental Results

The deblurring function can be implemented by two methods. One is to prepare the B-type deblurring function by photocopying. A 1/2 + sign (cos $2\pi f_o y$)/2 Ronchi grating with a spatial frequency to and a rect [(x-nl)/] mask which has N Δ width slits spaced by 1 are overlapped for a second exposure. Then, the Ronchi grating is moved in the y-direction by 1/2 of a grating cycle and the slit mask is translated in the x-direction for a distance Δ for the next exposure. The treated mask is shown in Figure 5. Because the y-direction grating of two neighboring slits differ by a half cycle, the phase difference of the two first order diffraction images of two neighboring slits is π when this mask is used. This is the B-type deblurring function. This mask, after filtering (i.e., taking the first order diffraction) can perform the deblurring convolution operation h $\circledast$ s.

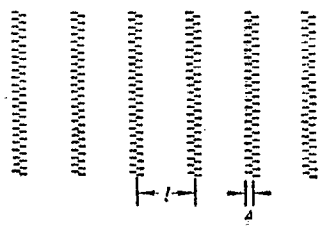


Fig. 5 Type-B Deblurring Function Mask

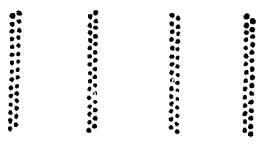


Fig. 6 Type-A Computer-generated Deblurring Function Mask

The other method is to use a computer generated mask to realize the deblurring function, as shown in Figure 6.[9] In this case, a pinhole structure, instead of a grating structure, is used. Thus, we have some flexibility and are capable of fabricating the type-A filtering function. However, masks thus fabricated have very low spatial frequency in the y-direction, approximately 10 line/mm. In the following we shall see that when an extended light source is used the first and zeroth order overlap and the required function cannot be obtained. For this reason, the frequency fy has to be high, i.e., $fy > 1/fx$ where 1 is the length of the extended light source, f is the focal length of the lens and λ is the wavelength. By doing so, it can be assured that the first order diffraction is separated from other orders to obtain the correct deblurring function. To accomplish this goal, the planar hologram of this computer generated mask is recorded by incoherent light. Because fy is determined by the angle between the object beam and the reference beam, it is very easy to obtain a high spatial frequency (fy $\sim$160 line/mm). By using this incoherent light holographic method,[7] we were able to obtain an almost noise free mask. In the following, two methods are used to perform the deblurring operation.

1. Filtering With Monochromatic Incoherent Linear Light Source

The deblurring operation is a one-dimensional operation. In the x-direction, it is required to be coherent spatially. Otherwise, the system cannot perform any amplitude operation.

In order to obtain a linear light source, a coherent linear light source can be formed by placing a cylindrical lens behind a quasi-straight laser beam. A piece of rotating ground glass is placed on the focal plane of the cylindrical lens to make each element on the line source incoherent. A y-direction slit (approximately 80 μ wide) is placed behind the rotating ground glass to ensure spatial coherence in the x-direction.

The schematic diagram of filter deblurring by a monochromatic incoherent line source is shown in Figure 7. The blurred image S is multiplied to the filtering function H at the rear focus of L2 after Fourier transformation by the lens L2. Through the transformation by the lens L3, the convolution $s \circledast h$, the cross correlation $s \circledast h$ and the direct current term are at the output plane. Because h is a real function and is symmetric, the convolution coincides with the correlation. The deblurred image is thus created at the top or bottom of the output plane in Figure 7. Because an incoherent line source is used, each element of the light source is equivalent to an independent point source. These point sources shine on the blurred image from all directions so that its Fourier transform is projected on various vertical positions of the filter H. It is equivalent to the multiplication of S and H at different positions. After transformation by the lens L3, the convolution operations in different channels are obtained. From this we know that the system introduces some redundancy.

The filter H is actually a holographic filter. Because it is used in a line source system, the function is expanded in the y-direction in order to facilitate the convolution in different channels. We used the optical path in Figure 8, in which a cylindrical lens is used to create a line source to extend from one point into a line in the y-direction. The deblurring mask h (B-type) mentioned in the previous section is used to perform a Fourier transform through lens L3 to record its hologram at its first order diffraction to obtain the holographic filter H.

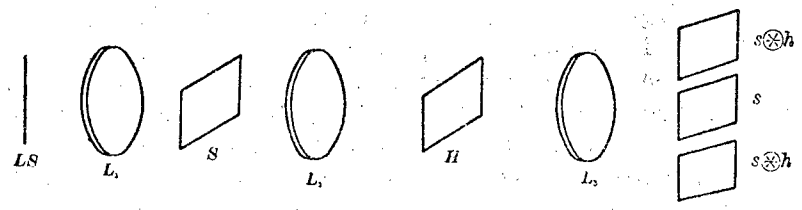


Fig. 7 Optical Path for an Incoherent Monochromatic Filtering Deblurring System

Figure 9 shows the experimental results. Figure 9(a) is the blurred image due to linear motion. Figure 9(b) is the deblurring result using an incoherent line source. Figure 9(c) is the deblurring results using a coherent light source. One can see that the noise is significantly suppressed by the incoherent light system.

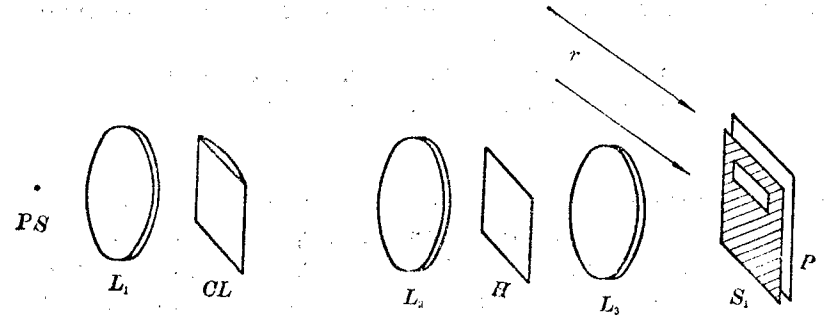


Fig. 8 Filter-making Optical System

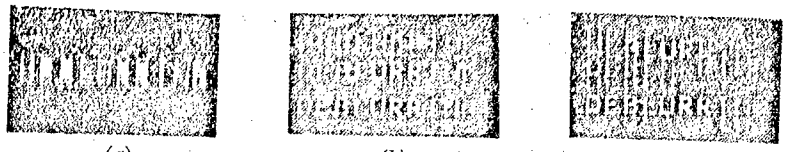


Fig. 9 Experimental Results

Theoretically the type-B deblurring function should not give two identical restored images. From the results, there is some residual images. The reason is that the positions of two neighboring gratings cannot be shifted by just half a cycle in preparing the filtering function. Therefore, the phase difference is not π and the presence of residual image is natural.

2. Convolution by Linear White Light Source[5]

The system is shown in Figure 10. The deblurring (A-type) mask h(x.y) is

$$h(x, y) = a_0 + |r_o(x)| \cos[2\pi f_0 y + \phi(x)], \tag{13}$$

Here, $r_c = |r_c| \exp(i\phi)$ is the deblurring function, f_0 is the spatial carrier frequency in the y-directions, and a_0 is a constant. This deblurring function performs filtering at S_1, i.e., extracting the first order diffraction. Then, the image is projected on the deblurred image S. Through the lens L4 and cylindrical lens CL, the image is formed on the plane P in the y-direction. In the x-direction, only the lens L4 is active. Therefore, a Fourier transform is performed in this direction. This system thus creates a one-dimensional Fourier transform. In other words, it is a one-dimensional convolution operator.

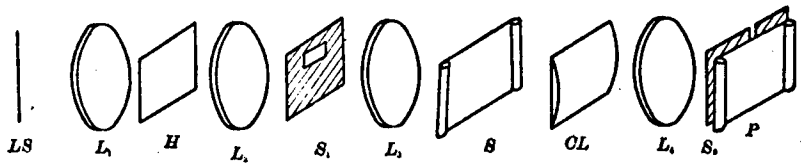


Fig. 10 White Light Optical Convolution System for Deblurring

We noticed that this is an achromatic optical system. The deblurring mask is an optical grating and the phase difference between two neighboring gratings in the y-direction is a half cycle. Therefore, the phase difference between two neighboring pulses is always π regardless of the wavelength. Hence, at any wavelength the correct deblurring function can be obtained. In addition, spatial filtering requires that the first order diffraction be separated from other orders. This is met even when a white light source is used. Because as long as the carrier frequency in the fy direction is sufficiently high the first order can always be separated from others in the visible region, white light may be used in the system.

Similar to the filtering method described before, image is formed in the y-direction and there is no spatial coherence requirements. Therefore, a line source may be used. In our experiment, the line source is 80 μ wide in x-direction and 5mm wide in the y-direction. Compared to a point source, the intensity is increased by several dozen times. Moreover, the redundancy is improved.

It is necessary to place a slit S2 on the output plane (at x=0) (See Figure 10). The light distribution on the slit is the convoluted value of h and s at a particular time. Therefore, it is necessary to scan the blurred image S and the recording film synchronously. The intensity distribution on the film is [8]

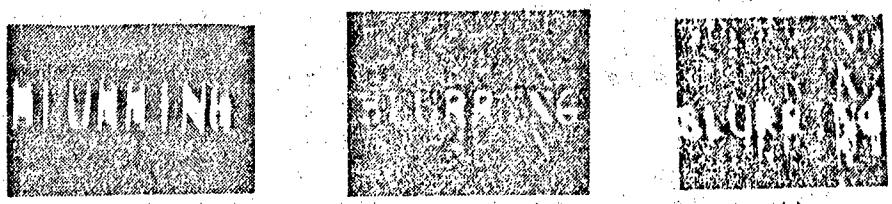
$$I_0(x_i) = \left| \int s(x_i - x)\, h(x)\, dx \right|^2, \qquad (14)$$

The variable x_i is the displacement relative to the input plane.

In this experiment, a 200W high pressure mercury lamp was used as the white light source. It has a broad spectral range with an almost continuous background. The results are shown in Figure 11. Figure 11(a) is the blurred picture. This blurred pattern is different from that in Figure 9. It is a high contrast record, instead of linear record. A stronger signal can be obtained through convolution. The drawback is that some residual image exists as shown in Figure 11(b). Figure 11(b) is the deblurred image obtained by white light. Figure 11(c) is the result obtained by He-Ne laser. Obviously, the signal to noise ratio is better in the white light system. This improvement is attributed to the reduction of the time coherence of the light source. Furthermore, the linearity of the light source is extended to reduce the spatial coherence. The objective of noise suppression is accomplished.

IV. Comparison of Two Methods

As described earlier, there are two image deblurring methods, i.e., filtering and convolution. Because an incoherent light source is used and spatial coherence in the x-direction is required, therefore, the linearity of the light source in the x-direction becomes very narrow. Thus, the utilization of the light energy is severely limited. If a point white light source is used, we may not have enough light intensity to complete the process. Therefore, there is a need to analyze the difference in light utilization.



(a) (b) (c)

Fig. 11 Experimental Results

Let us assume that both methods use monochromatic an incoherent line source. Furthermore, let us assume that the power of the light source is identical. Thus, the light intensity can be normalized.

In the convolution method, the filtering function can be simplified as a single rectangular function rect (x/Δ) because only light utilization rate is of concern. As shown in Figure 12, the light amplitude on the P_1 plane is t_{p1} = rect (X/Δ) and the diffraction efficiency from P_1 to P_2 is α_x. Therefore, the light amplitude on the P_2 plane is $tp_2 = \alpha_x$ rect (X_2/Δ). The width of the

blurred image on P_2, 1, is larger than the filtered pulse width $1 >> \Delta$. Hence, it has no direct effect on the light distribution. On the P_3 plane, the light amplitude is $tp_3 = \sigma_0 \Delta \sin c\ (x_3 \Delta / \lambda f)$ where f is the focal length of the lens L3 and λ is the incident wavelength. The width of the sinc function is approximately $\delta x_0 \sim \lambda f / \Delta$. However, the width of the deblurred image is only Δ. Hence, the light utilized is $\Delta / \delta x = \Delta^2 / \lambda f$. Thus, the light utilization rate of the whole system is

$$P_c \sim \sigma_h \Delta^2 / \lambda f_o \qquad (15)$$

In the filtering method, the amplitude on the P_3 plane is the convolution

$$\sigma_H^{1/2} \int \mathrm{rect}(x'/l) h(x' - x + \alpha \lambda f) dx',$$

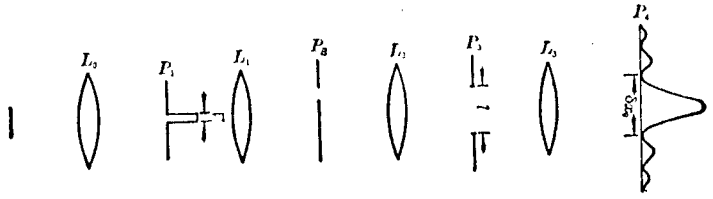


Fig. 12 Convolution System, Analytic Diagram of Light Utilization Ratio

h(x) is the Fourier transform of the filter H(fx), σ_H is the diffraction efficiency of the holographic filter and α is the off-axis angle of the holographic filter. Similarly, h(x) can be simplified to a rectangular function rect (x/Δ). Therefore, it is the convolution of two rectangular functions. The area of energy is identical to that of a single pulse. No light energy is lost in convolution. Therefore, the light energy utilization rate on the output plane is

$$P_f \sim \sigma_H \qquad (16)$$

In our experiment, $\lambda = 6 \times 10^{-5}$ cm, f = 20cm, and $\Delta = 0.05$ cm. The mask h(x) is a Ronchi grating, i.e., a rectangular amplitude grating. The diffraction efficiency $\sigma_h \sim 9$ percent. However, H(fx) is a holographic filter whose diffraction efficiency is about $\sigma_H \sim 1$ percent. Comparing equation (15) to (16), we get Pf/Pc ~ 4.3.

The conclusion is that light is utilized more effectively in the filtering method as compared to the convolution method. This is in agreement with our experimental observation. However, we must point out that white light sources can only be used in a convolution system.

V. Conclusions

With respect to image deblurring, an incoherent light system can drastically improve the signal to noise ratio of the restored picture as compared to a coherent light system. This point was proven experimentally. Furthermore, the filtering function of this system is easier to implement than an inverse filter. It avoids the need for the so-called "sandwich filter." In addition, it is not possible to obtain an arbitrary high picture compression ratio when using an inverse filter. This is because we cannot include infinite poles in preparing inverse filter. Until now, only 3 or 5 poles are used. However, in our system the compression ratio is only related to $\Delta/1$. In principle Δ can be arbitrarily small. Therefore, we can get a high compression ratio. It should be pointed out that a white light system has the characteristic capability to process color pictures. It will be experimentally proven in the future.

However, this new system is less efficient in light utilization as compared to a conventional inverse filtering operation. This is because an inverse filter is an in-line operating system while the new system is an off-axis operating system.

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12553
CSO: 4008/68

APPLIED SCIENCES

ASTROMETRIC METHOD ADVANCES ASTRONOMY, GEODESY

OW271236 Beijing XINHUA in English 1213 GMT 27 Mar 85

[Text] Kunming, 27 March (XINHUA)--Chinese astronomers have developed a new method to determine the absolute positions of stars that can be used in both high and low latitudes.

This will enable China for the first time to manufacture the meridian circle, a device for working out star catalogs and astronomical refractional tables.

It will also pave the wave for developing China's astronomy and geodesy, the science of earth surveying.

The Chinese Academy of Sciences' Yunnan Observatory Astrometry Institute says only 12 observatories in the world use the meridian circle, for the traditional method can be used only in high latitudes, and the resulting catalog is not accurate.

China's observatories, being in low latitudes, have had no meridian circle and no star catalog of their own.

The new method was developed by a group led by associate research fellow Mao Wei of the Astrometry Institute, in Kunming (15 degrees north).

They say their experimental device obtained more accurate data than those used in foreign observatories between 1982 and 1983.

Professor Heinrich K. Eichhorn, chairman of last year's 109th international astronomical union symposium, wrote to Mao Wei: "You and your colleagues in the PRC have established youselves as leaders in the area of modern ground-based astrometry."

The method is also applicable in measuring astronomical refraction, basic to geodetic surveying, says Mao.

A manifold meridian circle, he says, is being made in Nanjing according to the new method, and China's first high-precision star catalog and astronomical refractional table are expected to be compiled in the next few years.

A 200,000-word treatise by the group on the method of meridian astronomy is nearing completion.

CSO: 4010/120

APPLIED SCIENCES

BRIEFS

SATELLITE SYSTEM DEVELOPED--Shanghai, 3 April (XINHUA)--Shanghai's Jiaotong University has developed a solar-batter-powered system of satellite attitude control, according to university officials. The new system passed technical approval in Wuxi on 30 March. The system can control satellite attitude more flexibly and exactly than air jets traditionally used to achieve the same purpose, the university officials said yesterday. Various factors interfere with a satellite's original orbit, hence the need for adjustment from time to time. [Text] [Beijing XINHUA in English 0713 GMT 3 Apr 85]

EARTHQUAKE FORECASTING RESEARCH--Beijing, 2 April (XINHUA)--The State Seismology Bureau has gathered 300 scientists to conduct earthquake prediction and engineering research at western Yunnan's Dianxi Earthquake Forecast Center. The Danxi center, at Xiaguan, 500 kilometers northwest of the provincial capital of Kunming, is China's largest earthquake research center and a cooperative project between China and the United States. The bureau's science and monitoring department head Chen Xinlian said here today that the 40,000-square-kilometer center's 40 observation stations have digital seismographs, 64-channel detectors, magnetometers, laser rangefinders and telemetric seismological networks. The main building houses a computer system and labs. An extensive program will cover seismic activity, fault motion, paleoseismology, crustal structure, stress fields, terrestrial magnetism, chemical changes in underground water and terrestrial stress. The region is ideal because of its complex geology and frequent earthquakes, Chen said. It is planned to turn the center into a seismological experimentation area with world standards. [Text] [Beijing XINHUA in English 0727 GMT 2 Apr 85]

NEW CHINESE MICROPROCESSOR--Beijing, 31 May (XINHUA)--A new Chinese character microprocessor passed its certification tests here yesterday. The microprocessor uses an English-language typewriter keyboard to represent different strokes of Chinese characters. Operators can "build" the characters by tapping an average of less than 1.5 letters. No specialized training is required. The microprocessor can store over 7,000 Chinese characters and ten thousand phrases. It was designed by the Institute of Computing Technology of the Chinese Academy of Sciences. [Text] [Beijing XINHUA in English 0653 GMT 31 May 84 OW]

SICHUAN COMPUTER COMPANY--Chengdu, 30 Aug (XINHUA)--a joint computer company was launched in Chengdu, capital of Sichuan Province, today to aid the development of computers in western China. The Huaxi Company will manufacture, import and sell computers, components, peripheral equipment, and software. It will also undertake contract projects and leasing, and provide other services, including consultancy. The company, jointly founded by more than 30 factories, research institutes, and colleges, has 3,000 technicians. More than 3,000 computers are now in use in Sichuan. [Text] [Beijing XINHUA in English 1444 GMT 30 Aug 84 OW]

MICROCOMPUTERS IMPORTABLE AS PERSONAL LUGGAGE--Beijing, 31 Jul (XINHUA)--Microcomputers with peripheral equipment will be allowed to be brought into China by overseas Chinese passengers and Hong Kong and Macao compatriots as personal luggage, according to a new regulation of the General Administration of Customs effective from tomorrow. According to this regulation, microcomputers will be included in a classification embracing television sets, radio-recorders, cameras, refrigerators and washing machines, one of which may be imported by overseas Chinese, duty-free, on their first visit to China within a year, and the rest may be brought in after paying import duty. Microcomputers will also be put on the list of articles embracing wristwatches, radios, television sets, radio-recorders, cameras, electric fans, bicycles and dewing machines, one item from which may be brought in once a year after paying import duty by Hong Kong and Macao compatriots and by mainland residents back from non-working visits to Hong Kong or Macao. [Text] [Beijing XINHUA in English 1051 GMT 31 Jul 84 OW]

JOINT VENTURE IN COMPUTER TERMINALS--Beijing, 4 Aug (XINHUA)--A production line making computer terminals--a joint venture between American and Chinese interests--went into operation in Beijing today. The products have been developed by Compac of the U.S. and the Beijing Electronic Display Unit Plant. The production line has an annual capacity of 20,000 computer terminals. All the key equipment, instruments and technology are provided by the American side, with the workshops, designing, assembling and manufacturing of related components by the Chinese side. The production line began trial runs last April. A strict test in the past 3 months showed that the performance of the terminals had reached international standards. Beijing is a main center for producing computers and large-scale integrated circuits in North China, and will speed up the construction of a series of production lines through the import of technology and technical cooperation, aimed at spreading the use of microcomputers in different areas. [Text] [Beijing XINHUA in English 1431 GMT 4 Aug 84 OW]

CSO: 4010/136

LIFE SCIENCES

CANCER PREVENTION, TREATMENT DISCUSSED

Beijing RENMIN RIBAO in Chinese 7 Jan 85 p 3

[Report by correspondents Chen Zujia [7115 4371 3946] and Dong Huanjia [5516 3562 3946]: "A Heartening Step in the Fringe of Our Country's Cancer Prevention and Cure--Greater Progress Made in Prophylactical Therapeutics and Basic Research in the Five Principal Kinds of Cancer"]

[Text] The reports supplied by the Cancer Prophylactical Therapeutics Key Task Expert Team of the State Science and Technology Commission indicate that during the past 2 years our country's science and technology workers have taken a heartening step on the path of cancer treatment and prevention that is suitable for our country; this is a combined key task in the lowering of our country's common tumor incidence rate and mortality, and their related basic research.

In the past 2 years of key cancer task research, we have changed the old habit of following foreign research and embellishing their results. During the early seventies, science and technology workers began large-scale area surveys and investigations and gained a basic understanding of our country's cancer mortality and the characteristics of its geographic distribution. Based on this foundation, they selected stomach, esophagus, liver, lung and nasal pharynx cancer as the objectives of the key task. According to statistics, these five kinds of cancer account for 86 percent of cancer incidences. The science and technology workers have penetrated the high cancer incidence areas to carry out investigations, integrating laboratory research and on-site investigation, combining research on disease causes with the study of treatment and prevention and unifying prevention and treatment. They have drawn from the results of international research and new techniques to aim their studies in the applications of basic theories in developing cancer genes, cancer transfers and tumor cancer immunology. Currently, great progress has been made in prophylactical therapeutics and in the basic theories on these five kinds of cancer.

Liver cancer: large-scale voluntary immunological experiments have been carried out on the main causa morbi of hepatitis B virus and aflatoxin. Two thousand newborn infants have received hepatitis B vaccine inoculations, in an area of 230,000 people, and a large-scale lowering of the hepatitis B virus carrying rate has been achieved. Meanwhile, systems of determination techniques for aflatoxin immune concentrate and immunology have been established.

Nasal pharynx cancer: the important effect of EB virus on nasal pharynx cancer incidence has been verified. The early diagnostic techniques have been improved and elevated, and the clinical and on-site discovery rates of the disease in the high-incidence area have been raised to more than 90 percent from 60 percent.

Esophagopharynx: research has been carried from the simple environmental factors causing cancer to the internal human incidence factors and mechanisms. It has been verified that nitrosamine has an important effect on the development of esophagus cancern incidence and that people in the high-incidence area are found to have more nitrosamine in their bodies than those in the areas of low incidence. At the same time, it has been proved that vitamin C can prevent the synthesis of nitrosamine in the human body.

Stomach and lung cancer: it has been found that the particular eating and drinking habits in some localities are intimately related to stomach and lung cancer incidences. A number of monoclonal antibodies have been obtained for stomach and lung cancers.

Basic theory: for the first time, it has been proved throughout the world that human primary liver cancer exists in cancer genes, and this has clarified the establishment of the foundations of the canceration mechanism. The first models of a cancer transfer machine have been made in our country.

Photosensitive cancer treatment is an internationally developed technique of recent vintage. Our country already can produce this kind of dye laser, and it has manufactured photosensitive medicinal hematoporphyrin and has accumulated over 1,000 cases. From the discovery of tumor cancer on the treatment chart to the cure inside the body cavity, there are always different near-term results. The eradication rate of vesical cancer can reach 83 percent.

12744
CSO: 4008/206

LIFE SCIENCES

SCIENTIFIC FORUM ON GENE BANKS

Beijing GUANGMING RIBAO in Chinese 4 Jan 85 p 3

[Article by Fang Xinfang [2455 1800 5634]: "Developing Microbiological Gene Banks"]

[Text] It is commonly known that superior breeds of animals and plants can bring into play great economic benefits, but the importance of microbiological strains is not much noticed by people. Actually, superior microbiological strains have the same great effects on the four modernizations program.

In order to triple our industrial output, especially to go one step further in making our farm economy prosperous, it is necessary to go all out in developing in the production of agricultural by-products; it is possible to triple or quadruple the value of agricultural output. The most important and most economically effective technology in agricultural by-products is the microbiological fermentation technology. The production of food, feeds, medicine, chemical engineering, etc. cannot deviate from the process of microbiological fermentation. The microbiological industry will have a more and more important influence on the national economy.

The key to the development of the microbiological industry is microbiological strains. The quality of strain productivity affects the well-being of the microbiological industry. The creator of steroid chemistry Wen-dao-si [phonetic] said that he never imagined that in a short time some of the steroid compounds would achieve factory-scale production; this is due to the participation of microbiology. That our country can very quickly produce a pine steroid hormone is due to our finding the suitable melanin in the production. Our country's nucleotide industry was born from having selected the very active citrinic penicillin phosphoric acid diesterase. In the early fifties, sorbose fermentation bacteria was sieved, and the fermentation production of vitamin C was begun. During the seventies, a superior strain for the two-step fermentation was also found, and this enabled the level of our country's fermentation-produced vitamin C to reach the forefront of the world's producers.

The nurturing of the improvement of the strain production characteristics is an important way of increasing the economic benefits of the fermentation industry. Utilizing induced selective breeding can improve the strain's

productivity from several times to several hundred times. A substantial portion of the microbiological industry's annual output value has been achieved through the improvement of strains. Therefore, exploration into strains is an important item. The recently established genetic engineering utilizes the reconstitution of genes to create new strains, affording the production of useful material which could not be made by the microbes previously and enabling the capabilities of microbiological strains to reach a new level.

The preservation of strains and the taxonomical determination of microbes are also very important. They join the elevation of strain productivity and synthesis to form the triad of microbiological strains.

We know that the microbes can be divided into beneficial and harmful types. Our objective is to utilize and elevate the beneficial microbes and convert the harmful ones to beneficial ones. However, be it harmful or beneficial, it must be studied so that control can be exercised and then made to go through breeding metabolism according to human requirements. In the past 30 or so years, we have trained a basic cadre of specialists in microbiological taxonomy. However, due to some restrictions of the situation, this discipline has not been promoted or popularized, and thus microbes had only limited applications. Currently, there is an urgent need for the research and development of determination taxonomy.

The elevation of microbiological production capability is an important way for the microbiological industry to improve economic benefits. However, using quantity to preserve quality and then converting quantity are the principal methods of research. It is necessary to attain a large number of strains, in the range of hundreds of thousands, to carry out the work in order to achieve the effect of doubling the results with only half the effort. Hence, it is necessary to do the strain preservation well, that is, to establish a microbiological gene bank.

Our country began strain preservation work in the 4th decade of this century. After Liberation, this work achieved great development. In 1951, the Chinese Academy Sciences set up the Chinese Strain Preservation Committee. In 1979, the State Science and Technology Commission and the Chinese Academy of Sciences set up the Chinese Microbiological Strain Preservation Steering Committee. The related central ministries also established various microbiological preservation centers. Our country's strain preservation has an initial model, the country-wide preserved strains number some 20,000 and a "Chinese Strain Index" has been compiled.

Although our country has been richly endowed by nature, with broad lands and a multitude of strains, we are a great distance from the advanced countries in the quality and quantity of our strain preservation. For example, some studies show that 22 categories and 123 species of yeast are related to food, but only two-thirds of the categories and one-sixth of the species above are listed in the "Chinese Strain Index." Beer is a greatly developed beverage in our country, and someone found 14 categories and 57 species of yeast related to beer, but the "Chinese Strain Index" contains only 8 categories and

17 species of these. How can we catch up? It is necessary to purchase or exchange for a few strains abroad, but we must basically be self-sustaining.

I consider it necessary to have a strain preservation plan and objectives in fulfilling the requirements of the construction of the four modernizations. It is necessary to establish the foundations for large-scale strain development during the "Seventh 5-Year Plan" period; on the one hand, to increase the quantity of strain preservation since the strains needed for production, health, scientific research, teaching, etc. must be preserved, and, on the other hand, it is necessary to establish the requisite conditions and trained personnel to handle large-scale strain preservation.

Our country's strain preservation must reach the quantitative and qualitative level of the advanced countries in strain preservation toward the end of this century. In the next 10 to 20 years, the strains currently used in the microbiological industry must be replaced by superior strains and we must eradicate the harmful bacteria. The direct or indirect microbiological output values for socialist construction should not be limited to just tripling.

I propose that an open type of "strain research center" be established. It should have sections for microbiological taxonomic determination, strain exploration, preservation, etc. to facilitate study and research by our people as well as a few scientists in this field from abroad. Results can be quickly obtained with rich sources of strains and consultations with experts. Thus, this will help train thousands of microbiological workers with practical experience while directly contributing to the development of our country's microbiological industry.

12744
CSO: 4008/206

LIFE SCIENCES

BRIEFS

CONTRACEPTIVE METHOD DEVELOPED--A recoverable embolic method for the spermatic duct has recently been authenticated in Taiyuan. The authentication committee, with Wu Jieping [0702 7132 1627] as its chairman, considers it to be highly effective, safe, simple, economical and recoverable; it has achieved an advanced international level, and it is worthy of widespread promotion. This type of new contraceptive method uses an injector to place an embolic fluid of liquid polyurethane macromolecule compound into the spermatic duct, making it solidify into an embolus in the quickest way, to block the spermatic duct, thus preventing the passage of sperms and achieving contraception. This type of solidified embolus will not cause the wall of the spermatic duct to adhere, and, when necessary, the embolus can be easily extracted, letting the spermatic duct to flow free again. The result of this scientific research has been achieved by the cooperation of Zhao Shencai [65392 3932 2088], deputy administrator of the Shangxi Provincial People's Hospital, and the Scientific Research Cooperative Section. [Text] [Article by He Haiyi [6320 3189 3015] and Zhang Xiaodi [1728 1420 1717] [Beijing GUANGMING RIBAO in Chinese 26 Nov 84 p 1] 12744

CSO: 4008/206

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

CONFERENCE ON SPACE, MOVING BODY CONTROL TECHNOLOGY HELD

Beijing YUHANG XEUBAO [JOURNAL OF THE CHINA ASTRONAUTICS SOCIETY] in Chinese No 1, 31 Jan 85 pp 110-111

[Article by Zi Yu [1807 1342]]

[Text] A geosynchronous experimental communications satellite developed by China has been successfully launched into orbit; the satellite was used to provide real-time broadcasts of the activities during the 35th anniversary celebration of the People's Republic to all corners of China. As the nation rejoices on this occasion, members of the Space Control Committee of the China Astronautics Society and the Space and Dynamics Control Committee of the China Automation Society gathered in the City of Zhenjiang to report on the achievements of China's space control technology and to exchange technical experiences with one another.

On the morning of 8 October, Deputy Director of the Space Control Committee of the China Astronautics Society, Comrade Shen Jianan gave the opening speech and declared the conference in session. The assistant mayor of the People's Government of Zhenjiang, Mr. Nie, and chairman of the City Scientific Association each gave a welcoming speech, and wished the conference a success.

The 68 representatives who attended the conference included professors, instructors, senior engineers, engineers, and graduate students from the National Defense Science and Engineering Committee, the Ministry of Space Industry, research institutes and control stations affiliated with the Ministry of Aviation Industry, Institute of Automation of the Chinese Academy of Sciences, the National University of Defense Technology, the Harbin Industrial University, the Shanghai Jiaotong University and the Northwest Industrial University. After presenting their papers at the main conference, eight comrades split into three groups for detailed technical discussions; a total of 57 papers were presented. Discussions during the meeting were intense and active; it was generally agreed that this conference produced greater technical achievements than the first conference. There are three distinct features of this conference:

1. Many papers presented here contain the results of major achievements of China's aeorspace technology. They are not only theoretically rigorous, but have also been experimentally verified; the experimental results allowed

further improvements of the theoretical analyses. While during the first conference, many problems were still in the planning and conceptual stage, results of these scientific research efforts are being reported in this meeting.

2. New developments in space control have been reported as a result of applying new theories, new technologies, and new procedures. Significant advances have been made in both the scope and depth of the studies of celestial dynamics and flexible bodies. Modern control theory has been used in a wide range of applications. Computers are increasingly being used not only on artificial satellites and carrier rockets, but also on ships and balloons. In addition, attitude control thrust devices, and precision attitude-sensing devices such as CCD star sensors, coarse and fine sun sensors, infrared horizon sensors, self-correcting gyroscopes are also being developed at a rapid pace.

3. Representatives at the conference come from all age groups. There were four senior experts over 55, but most of them were middle-aged and younger technical personnel. An unprecedented phenomenon was that nine comrades were under 35. Based on the papers presented at the conference, these young comrades not only have a solid theoretical background, but also have an open-minded and cautious scientific attitude. From this, we are optimistic that China is cultivating a new generation of experts in space control technology, and its future is extremely promising.

In order to acknowledge outstanding achievements and to improve the quality of the technical conference, an activity was organized to review the papers presented at the conference. Based on the reviews, superior papers were selected for publication in the "Journal of the China Astronautics Society" or the "Journal of Automation" in order to promote the exchange and distribution of the research results.

As the conference adjourned on October 13, all representatives extended their thanks to the Zhenjiang Radio Component No. 2 Factory for their dedicated support, and to the No. 502 Office of the Minsitry of Space Industry for its effort of careful preparation and organization. They also wished one another greater success in the next conference.

3012
CSO: 4008/250

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

SECOND NATIONAL CONFERENCE ON NUCLEAR ELECTRONICS, NUCLEAR DETECTION DEVICES

Beijing HEDIANZIXUE YU TANCE JISHU [NUCLEAR ELECTRONICS AND DETECTION TECHNOLOGY] in Chinese Vol 5, No 1, Jan 85 pp 59-60

[Article by Wang Feng [3769 6912]]

[Text] The second national conference on nuclear electronics and nuclear detection devices, sponsored by the Nuclear Electronics and Detection Technology Society, was held in Kunming from 7 October to 13 October 1984. The purpose of the conference was to exchange information on recent advances made in the research and production of nuclear electronics and nuclear detection devices, to review the scientific achievements in this area, and to promote academic ideas in this country. One hundred fifty-three representatives attended the conference and 152 technical papers were received, 104 of which were presented at the conference by 99 representatives. The attendees included experienced senior scientists, active middle-aged technical personnel, as well as research workers of the younger generation; they represented 47 different organizations from all over the country. In a democratic and academic atmosphere, the representatives engaged in intense discussions about a wide range of academic topics. This conference fully reflected the highly active developments in nuclear electronics and nuclear detection devices in recent years.

Deputy committee chairman of the Society, Prof Yang Yengming, presided over the opening ceremony, and the opening speech was given by deputy committee chairman Prof Zhang Zishan.

During the conference, representatives heard three special reports: "A Review of Nuclear Electronics and Detection Technology" by research scientists Xi Deming, "Current Status of Nuclear Electronics" by research scientist Xin Xianjie, and "Application of Computers in Nuclear Science Laboratories" by research associate Dai Guiliang. A side panel discussion was organized to solicit opinions and views from experts on the topic "China in the year 2000." Several representatives also participated in a meeting discussion on recent research activities in the area of compound semiconductors.

Deputy committee chairman and research scientist, Xin Xianjie presided over the closing ceremony, and the closing speech was given by deputy committee chairman Xi Deming.

A large percentage of the technical papers presented at the conference were concerned with the research and development of detection devices; they provided a fairly complete picture of recent activities in this area. It was acknowledged that significant progress had been made in the research and performance testing of semiconductor detectors, gas detectors, and scintillation counters. As a result of introducing advanced technologies, there had been major breakthroughs in certain performance indices of semiconductor detectors. The gas detectors developed by many research organizations in this country for their own spectrometer systems have reached certain accepted standards. Progress was also made in the development of gas detectors used in reactors, heavy ion accelerators, and for other applications. The research work in inorganic scintillators has received international recognition. The performance indices of Chinese-made bismuth germanate and barium fluoride crystals have reached a level comparable to those of foreign products; this provides favorable conditions for competing on the international market. Significant progress has also been made in recent years in heat-forged shaping technology for NaI (Tl) crystals.

In the area of nuclear electronics, progress has been made in fast electronics circuitries, low-noise pre-amplifiers, spectrometer amplifiers, analog-to-digital converters, and multi-channel pulse analyzers. The representatives pointed out that since micro and mini computers are widely used in nuclear electronics, we must increase our efforts to study front-end electronic circuitry in addition to the study of application of micro- and mini-computers; we must also emphasize the research efforts in basic circuit designs and key components. They also pointed out the importance of product reliability, which should be stressed by the production units. The idea of standardization of China's nuclear electronic instruments attracted a great deal of interest during the conference. Significant achievements were also reported in the area of nuclear hardening of electronic equipment.

It can be seen from the presented papers that in the area of large spectrometers, some preliminary results have been obtained concerning the prefabrication of spectrometers commonly used in high-energy physics laboratories.

It is also clear that new applications of nuclear instruments are constantly being explored in this country, but the number of papers describing the research work in this area is quite limited. There is also a need to intensify our efforts to study the problem of compatibility of various nuclear instruments.

To summarize, in the research, production and the expanded use of nuclear instruments, dedicated investigative efforts and studies, unified planning, and careful organization manpower are required to improve product stability and reliability, to facilitate instrument operation, and to achieve benefits from our investments.

The representatives suggested that the third national conference on nuclear electronics and nuclear detection devices be sponsored by the China University of Science and Technology sometime in 1986.

3012
CSO: 4008/289

PUBLICATIONS

BRIEFS

SHANGHAI COMPUTER JOURNAL--The inaugural issue of JISUANJI JAO YU XUE [TEACHING AND LEARNING COMPUTERS] will be published this month by the Shanghai City Education Bureau and the Shanghai Normal College. This is a popular magazine about the application of microcomputers for both teachers and students. [Summary] [Shanghai City Service in Mandarin 1100 GMT 16 Mar 85 OW]

CSO: 4008/293

AUTHOR: WANG Dongjin [3769 2639 6651]
CHEN Jianhua [7115 1696 5478]
BAI Jianyue [4101 1696 6460]
PAN Qinghong [3382 1987 3163]

ORG: WANG, CHEN and BAI all of the Department of Chemistry, Fuzhou University; PAN of the Department of Chemistry, Zhongshan University, Guangzhou

TITLE: "Spectrophotometric Study on the Color Reaction of Tungsten-4,5-dibromophenylfluorone-surfactants System and Its Applications"

SOURCE: Beijing HUAXUE SHIJI [CHEMICAL REAGENTS] in Chinese No 3, 28 Jun 84 pp 139-144, 152

TEXT OF ENGLISH ABSTRACT: A highly sensitive color reaction of tungsten(VI)-4,5-dibromophenylfluorone (Br-PF)-CTAB-OP surfactants has been investigated spectrophotometrically. The tungsten(VI) complex is formed in 2.0-2.8 *N* HCl medium and is stable for at least 2 days. The molar absorptivity of the complex is 1.32×10^5 at 528 nm. The molar ratio of the complex has been estimated to be W(VI):Br-PF=1:2. Beer's law is obeyed for tungsten(VI) of 0-6 μg/10 ml.

Fe^{3+}, Al^{3+} 500; Mn^{2+} 125; V(V) 100; U(VI) 50; Cr(VI) 37); Mo(VI), Nb(V), Sn(IV), Zr(IV), Bi^{3+} 25; Ti(IV), Th(IV), Sb^{3+} 12; Ta(V) 6-fold excess do not interfere with the determination of W(VI) (4 μg/10 ml), when using CyDTA, NH_4F and tartrate as masking agents in the presence of $NH_2OH \cdot HCl$ and by boiling the solution for 10 minutes.

This simple and rapid method has been successfully applied to the determination of tungsten in steels and ores without separating W(VI) from the accompanying elements.

AUTHOR: LI Weixing [2621 5898 2502]

ORG: Department of Chemistry, Zhejiang Teachers' College

TITLE: "Computer-managed Reactions Between Organic Reagents and Metallic Ions"

SOURCE: Beijing HUAXUE SHIJI [CHEMICAL REAGENTS] in Chinese No 3, 28 Jun 84 pp 145-148

TEXT OF ENGLISH ABSTRACT: The method for calculating the optimum acidity and the appropriate acidity range of complexation reactions is discussed. It can be used in predicting the suitable formation conditions of binary and ternary complexes and polycomplexes. In order to get the $(pH)_{opt}$, $(pH)_{rag}$, logK-pH curve and other information, a computer program in BASIC language is presented. Finally some examples are given which have been verified by experiments.

AUTHOR: SUN Shixiang [1327 0013 4382]
ZHANG Lixing [1728 4539 5887]

ORG: Both of the Liaoning Provincial Central Laboratory, Geology-Mineral Bureau

TITLE: "Separation Enrichment by Column Chromatography with P507 Extraction Resin and Emission Spectrographic Determination of Microamounts of Rare Earth Elements in Ores"

SOURCE: Beijing HUAXUE SHIJI [CHEMICAL REAGENTS] in Chinese No 3, 28 Jun 84 pp 172-174

TEXT OF ENGLISH ABSTRACT: A column chromatographic method with P507 extraction resin in proposed for the separation and emission spectrographic determination of microamounts of rare earth elements in ores. The conditions for separation and the factors which influence the separation have been studied. The simultaneous working conditions and buffer for the spectrum analysis were selected. It is shown that it takes about 2 hours for column separation with an eluant volume of 25 ml and an enrichment factor of 10^5. The method has been applied to the analysis of ores. The variation coefficients of this method are ±4 - ±12 percent.

9717
CSO: 4009/146

AUTHOR: CAO Shiti [2580 6108 0232]
SUN Qin [1327 0530]

ORG: Both of Changsha Research Institute of Mining and Metallurgy, Ministry of Metallurgy

TITLE: "Spectrophotometric Determination of Trace Cadmium with 2,2'-dichloro-4,4'-dinitroazoaminobenzene"

SOURCE: Beijing HUAXUE SHIJI [CHEMICAL REAGENTS] in Chinese No 4, 28 Aug 84 pp 218-221

TEXT OF ENGLISH ABSTRACT: A new and very sensitive method has been developed for the spectrophotometric determination of trace cadmium with 2,2'-dichloro-4,4'-dinitroazoaminobenzene (I). Trace cadmium can be determined from the decrease in absorbance of 0.3-0.6 μmol (I) in 25 ml solution at pH 9.35-11.5 in the presence of 10-25 mg nonionic surfactant OP (emulsifier) at 550 nm, the maximum absorption wavelength of (I). Because the complex with a molar ratio of 1:3 between Cd (II) and (I) is formed, the maximum absorption wavelength shifts to 480 nm and there is no absorption at 550 nm. Beer's law is followed in the range of 0-12 μg Cd (II)/25 ml and Sandell's sensitivity is 7.0 x 10^{-4}μg/cm^2. The effect of 55 ionic species or compounds was examined. Hg (II) and Ag (I) seriously interfered with the determination, but 1 μg of Hg (II) or Ag (I) could be masked by 5 mg of Cl^-. Small amounts of cadmium in ore and concentrated waste water were determined satisfactorily with this method after suitable separation.

AUTHOR: DING Jihong
LI Zhanwu
WANG Xieqing
LU Wanzhen

ORG: All of the Research Institute of Petroleum Processing, Beijing

TITLE: "Application of Ion Exchange Chromatography in Petroleum Analysis--Separation of Basic Nitrogen Compounds in Gas Oil by Resin No 52"

SOURCE: Beijing HUAXUE SHIJI [CHEMICAL REAGENTS] in Chinese No 4, 28 Aug 84 pp 222-226

TEXT OF ENGLISH ABSTRACT: The exchange capacity of resin No 52 with 2,4-dimethyl quinoline and 2-ethyl-6-methyl pyridine has been determined to be 0.50 and 0.52 milliequivalent/ml of resin respectively.

When Shengli gas oil was treated with resin No 52 and eluted with benzene, 60:40 benzene-methyl alcohol and 8 percent methyl alcohol solution of isopropylamine, three successive nitrogen base fractions with increasing basicity were obtained and characterized.

9717
CSO: 4009/147

AUTHOR: ZHANG Peihuan [1728 0160 3883]
WANG Junde [3769 0193 1795]
CHEN Xinhai [7115 2450 3189]
et al.

ORG: All of Changchun Institute of Applied Chemistry, Chinese Academy of Sciences

TITLE: "A Computer-Controlled Direct-Reading Spectrometer"

SOURCE: Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 6, 20 Jun 84 pp 545-551

TEXT OF ENGLISH ABSTRACT: A computer-controlled direct-reading spectrometer system has been developed. The computer model JY-1 was constructed in 1975 by the joint efforts of Jilin University and our institute. When using this system for routine work, the operator needs only to select the sample group number representing the type of sample to be analyzed and the mode of data manipulation, and press the start-key on the keyboard of the operating panel. The computer will then turn on the excitation source and start the system running all steps, including pre-spark, integration, measurement and final print-out of the results according to the selected mode intensities, intensity ratios, standardized intensity ratios and percent concentrations with their respective element symbols.

References:

(1) Wang Junde [3769 0193 1795], et al., Analytical Chemistry, No 6, 1978, p 382.
(2) Japanese Scientific Electromechanical Devices, Operating Manual for Multi-Channel X-ray Fluorescence Spectrometer.
(3) Operating Manual for VEM-100 Direct Reading Spectrometer [produced by] Japan's Shimadzu Corporation.
(4) Operating Manual for DJS-130 Electronic Digital Computer, DJS-130 Joint Design Group, 1979.

9717
CSO: 4009/74

AUTHOR: LI Yufan [2621 0060 0416]

ORG: Department of Radio Engineering, South China Institute of Technology, Guangzhou

TITLE: "A Bilinear Algorithm for the Identification of Single and Multiple Faults in Analog Circuits"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 13 No 1, Jan 85 pp 31-37

TEXT OF ENGLISH ABSTRACT: A bilinear deviation theory for analog circuits is discussed, and an algorithm for the identification of single and multiple faults is proposed. With this algorithm, both hard and soft faults can be located and evaluated from insufficient measurements by solving linear algebraic equations. The fault testability is independent of the selection of test points. A comparison is made between this algorithm and two other algorithms using a numerical example.

AUTHOR: SUN Qiwan [1327 0796 8001]

ORG: South-West China Research Institute of Electronic Technology

TITLE: "Simple and Practical Formulae of Noise Bandwidth for Sampled Phase-locked Loops"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 13 No 1, Jan 85 pp 38-42

TEXT OF ENGLISH ABSTRACT: New computing formulae for the discrete total square integral are derived by means of bilinear transformation. Simple and practical formulae of noise bandwidth for several main sampled phase-locked loops based on the integral expressions and the important relationships of the formulae are given.

AUTHOR: GUO Xifan [6753 3556 0416]
LUO Yaoguang [5012 5069 0342]

ORG: GUO of the Data Communication Research Institute, Ministry of Posts and Telecommunications; LUO of Beijing Institute of Posts and Telecommunications

TITLE: "Recognition Method for Printed Chinese Characters"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 13 No 1, Jan 85 pp 43-48

TEXT OF ENGLISH ABSTRACT: A printed Chinese character's quadrantal terminal number and moment of inertia can be used as the unique features for its recognition. Based on this principle, a recognition system has been developed by means of neighbor category compatability and multi-level classification. The system has a high differentiating power for similar characters, thus meeting the need for a high capacity recognition system for printed Chinese characters. The experiment with 6,000 Chinese characters gives satisfactory results.

AUTHOR: CHEN Tirong [7115 9232 1539]

ORG: Chengdu Institute of Radio Engineering

TITLE: "Carrier Leakage and Temperature Sensitivity of Threshold Current in InGaAsP/InP Lasers"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 13 No 1, Jan 85 pp 65-71

TEXT OF ENGLISH ABSTRACT: Direct measurements of electron and hole leakage over the heterobarrier in InGaAsP/InP lasers are carried out by using a novel laser-bipolar-transistor structure. Experimental results indicate a significant amount of electron leakage under normal laser operating conditions, whereas hole leakage is found to be negligible. The electron leakage increases continuously with increasing injection, and is sensitive to the ambient temperature. By eliminating the electron leakage, an increase of about 30 K in the characteristic temperature T_0 is possible. The experimental observations can be explained by a model which takes the electric field and carrier heating effect into account. Following this line, a new laser structure is designed and realized, resulting in a low threshold current (~20mA) and a reasonably high T_0 (~90 K).

9717
CSO: 4009/140

AUTHOR: CHEN Shuchun [7115 6615 2504]
YI Guanhong [5939 7070 1347]
DAI Fengmei [2071 7685 1188]
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TITLE: "Study of Excited Energy Diffusion and Transfer by Time-resolved Laser-selective Excited Technique in Concentrated Nd-Phosphate Glasses"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 4 No 12, Dec 84 pp 1074-1080

TEXT OF ENGLISH ABSTRACT: In this paper, the laser-selective excited time-resolved spectroscopy technique is used to investigate the concentration quenching and energy diffusion and transfer between Nd^{3+} ions in the phosphate glasses in which the composition and Nd^{3+} concentration are similar to those of Nd X Y1-X P_5O_{14} crystal.

The experimental results shown indicate that this material has weak concentration quenching and the quenching rate is proportional to X. The laser-selective excited time-resolved spectra show that Nd ions are located in various local crystal-field sites in NP-1 glass with $N_0 = 4.2 \times 10^{21}$ cm^{-1}. The energy transfer and diffusion between Nd^{3+} ions take place through forced electric dipole-dipole interaction. In the temperature range of 77-150 K, the transfer process involving a thermal activation energy of 330 cm^{-1} was found. By fitting experimental data with theory, several energy transfer parameters are estimated.

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TITLE: "Measurement of Relative Oscillator Strength gf Using Pulse Optogalvanic Effect"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 4 No 12, Dec 84 pp 1081-1087

TEXT OF ENGLISH ABSTRACT: We present the quantitative relationship between the peak of the pulse optogalvanic signal and the intensity of the excited laser. On the basis of this relationship, it is possible to measure the relative oscillator strength of the atomic transition in a discharge tube, in which the population deviates from Boltzmann distribution, and the energy levels have an anomalous electric ionization rate. The feasibility of this method is shown by an experiment using a Ne hollow cathode discharge tube.

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SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 4 No 12, Dec 84 pp 1101-1106

TEXT OF ENGLISH ABSTRACT: A new holographic recording material-dichromated-polyvinyl alcohol (DC-PVA) used in real-time holographic recording is described. This material can be real-time developed easily, and fixed by using thermal radiation or light illumination at the very position in which it was exposed. In the experiment, some amplitude-phase holograms have been made. The resolution of the DC-PVA approaches that of dichromated gelatin (DCG), and the diffraction efficiency obtained is about 30 percent.

This paper gives the analysis of the mechanism of hologram formation in DC-PVA and holographic characteristics, and discusses several promising applications, such as real-time interferometry, information storage and character-recognition. The experimental results and photos are presented in the paper.

9717
CSO: 4009/154

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TITLE: "Observation of Thermal Emission and Nonthermal Emission from Electron Cyclotron Emission in CT-6B Tokamak Plasma"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 33 No 11, Nov 84 pp 1538-1545

TEXT OF ENGLISH ABSTRACT: In this paper, the results of observation of electron cyclotron emission in CT-6B Tokamak device plasma are presented. The ECE was detected by using PME radiometer which can work at fundamental (35GHz) mixing or second harmonic (70GHz) mixing. When the device discharged under low runaway conditions, the received signal emission at second harmonic mixing showed that it was the thermal emission associated with electron temperature, while under runaway conditions, the received emission at fundamental mixing showed that it was the nonthermal emission of the runaway electrons.

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TITLE: "Kinetic Ballooning Mode Analysis of Tokamak Plasmas with the Second Stability Regime Included"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 33 No 11, Nov 84 pp 1546-1555

TEXT OF ENGLISH ABSTRACT: The kinetic ballooning-mode eigenequation, which can be used to study the stability criterion in the second stability regime, is derived. It retains most of the important kinetic effects. The corresponding form of this equation for circular Tokamak is deduced to include the effects of the magnetic surface displacement and the poloidal magnetic field that become important in the second stability regime. The structures of the modes and the stability criteria for various configuration parameters are studied by using a numerical shooting code. Compared to the ideal MHD case, it is found that a new unstable branch of the mode exists in the second stability regime having a very weak growth rate. In addition, there are several kinds of marginal stable modes and their behaviors have been studied to examine the effects of the magnetic shear and the poloidal magnetic fields.

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TITLE: "Laser Isotope Enrichment Via Magnetic Deflection of Optically Polarized Atomic Beam"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 33 No 11, Nov 84 pp 1605-1609

TEXT OF ENGLISH ABSTRACT: Described is a novel method to enrich isotopes and isomers via magnetic deflection of optically polarized atomic beams. High electronic polarization with opposite signs for atoms of both isotopes respectively is achieved by selective optical pumping using lasers with different frequencies and polarizations and then the isotopes are enriched by deflecting the oppositely polarized isotopes along different directions by the inhomogeneous magnetic field in the spin selective magnet. Separation selectivity and throughput are evaluated and the advantages, disadvantages and prospects of possible application of the present method are discussed in comparison with other existing methods. An experimental scheme with lithium or potassium is suggested.

9717
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TITLE: "Studies on the Antifertility Effects of Anordrin and Its Analogues"

SOURCE: Shanghai SHENGLI XUEBAO [ACTA PHYSIOLOGICA SINICA] in Chinese No 6, Dec 84 pp 611-613

TEXT OF ENGLISH ABSTRACT: Anordrin (2α, 17α-diethynyl-A-nor-androstane-2β, 17β-diol dipropionate) has been used as a "vacation tablet" given to women on one month's vacation in China. As a result, interest has increased in this kind of compound. In this paper, studies of the antifertility effects are reported.

1. Isolation and Purification of α and β Isomers of Anordrin
Pure α and β isomers of anordrin were isolated from the mixtures of epimers of anordrin, used in previous studies, by low pressure column chromatography. Antifertility tests showed that implantations were protected by α-anordrin when a dosage of 5 mg/kg was given by gavage on day 1 after mating in 10 rats, while the same dosage of β-anordrin had no effect on implantation.

2. Transformation of Anordrin In Vivo
α-anordrin was incubated with the homogenate of rat intestinum tenue with its contents in vitro, or was fed to rats by gavage at 15 mg/kg. After 24 hours, ethyl acetate was used to extract the samples. In addition to α-anordrin, a white crystal (M.P. 156-157°C) obtained from extractives of intestinum tenue was identified as AF-45 (2α, 17α-diethynyl-A-nor-androstane-2β, 17β-diol) by spectral analysis. In addition, the blood from 10 rats treated with 15 mg/kg of anordrin given by gavage was collected 9 hours after medication and extracted with ethyl acetate. No anordrin was detectable by thin layer chromatography, but a significant amount of AF-45 could be found. Bioactivity of AF-45 and anordrin showed no significant difference by the time that antifertility ED_{100} of anordrin and AF-45 was 4 mg/kg and 3 mg/kg respectively ($P > 0.05$), and the uterotrophic potency of AF-45 in immature rats was 83 when anordrin was considered to be 100 ($P > 0.05$). Therefore, it is suggested that anordrin was hydrolyzed to break its bond of dipropionate and transformed into AF-45 to exert the bioactivity in vivo.

There was almost no anordrin or AF-45 which could be detected in urine when ^{14}C-anordrin was given to rats by gavage at 15 mg/kg. The major metabolite in urine of rabbits treated with anordrin at 20 mg/kg was identical to 2, 17-diethynyl-A-nor-$\Delta^{1,16}$-5α-androstane.

3. Binding Ability to Uterine Cytosol Estrogen Receptors (ER_c) in Rats
Cytosol was prepared by centrifuging the uteri homogenates at 20,000 x g for 1 hour at 4°C and 200 µl of cytosol was incubated with 1 nM [^{3}H]-estradiol for 18 hours at 4°C in the absence or presence of testing compounds. 200 µl of DCC was added to the tubes and then centrifuged for 15 min at 1000 x g to separate the bound and free [^{3}H]-estradiol. The dose of 50 percent inhibition of the [^{3}H]-estradiol binding to cytosol receptors and relative binding ability (RBA) of anordrin and its analogues was calculated. The results showed that the RBA of AF-45 and AF-57 (2α, 17α-diethynyl, A-nor-androstane-2β, 17β-dihydroxy, 2β-semisuccinate) was 36 and 54, respectively, when anordrin was considered to be 1. Therefore, it is suggested that free OH in 17β and 2β positions were essential for binding to ER_c.

4. Analysis of Relationship of Antifertility Effect and Estrogenicity
Antifertility ED_{50} and relative uterotrophic potency of anordrin, AF-45 and AF-57 in rats was compared with ethynyl estradiol (EE) in analyzing the inherent relationship within the antifertility effect and estrogenicity potency of anordrin and its analogues. It showed that the estrogenicity of anordrin and its analogues was not the unique contributer to their antifertility effect as indicated by the higher ratio of relative antifertility potency to relative estrogenicity potency of anordrin and its analogues than that of EE, which is considered as 1. Therefore, it is possible to get new compounds with high antifertility effects and low estrogenicity by modification of the structure.

9717
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TITLE: "Studies of Drugs for Removal of Incorporated Radionuclides--Synthesis of Some Chelating Agents with Substituted Phenol Polyamino-Polycarboxylic Acid and Their Effectiveness for Decorporation of Radionuclides"

SOURCE: Beijing ZHONGHUA FANGSHE YIXUE YU FANGHU ZAZHI [CHINESE JOURNAL OF RADIOLOGICAL MEDICINE AND PROTECTION] in Chinese No 2, 25 Apr 83 p 73

TEXT OF ENGLISH ABSTRACT: We have synthesized eight substituted phenol polyamino-polycarboxylic acid chelating agents. One or two aminodiacetic acids can chelate radionuclides in their molecules. Since these chelating agents are generally considered to be the very antidote for the removal of internally deposited radionuclides, we have used them for removing incorporated ^{144}Ce, ^{234}Th and ^{147}Pm from rats. Some the the chelating agents proved markedly effective, e.g., the clearance of ^{144}Ce from urine was increased 5 to 10 times.

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TAIWAN

10-YEAR PLAN FOR SCIENCE, TECHNOLOGY OUTLINED

OW090614 Taipei CHINA POST in English 6 Mar 85 p 12

[Text] The National Science Council [NSC] will soon complete a 10-Year plan for the development of this nation's science and technology, Chen Li-an, chairman of the NSC said yesterday.

The plan will include assessment of manpower and money required over the next 10 years and implementation of major science and technology tasks at relevant government organizations, Chen said.

Chen was reporting on this nation's science and technology development at a weekly meeting of the ruling Kuomintang's Central Government Department. He said a draft of the plan will be completed soon and will be submitted to the Executive Yuan for approval after further discussions and modification.

Chen said the ultimate goals of this nation's science and technology development are to develop the economy, to set up an independent national defense industry, and to upgrade the standard of living.

He said the NSC will coordinate research, development and production among all relevant organizations to set up an integrated system of science and technology.

The NSC will also promote large-scale research cooperation programs which involve the use of precious instruments. Chen said local researchers are demanding numerous instruments worth about NT$1 million each but the NSC has insufficient funds to meet the demand.

The problem is expected to ease from the second half of this year as more government investment will be made, he said.

The government will also accelerate training of researchers, Chen said. There are only about 10 research workers for every 10,000 people here, compared with about 20 in advanced nations, he added.

CSO: 4010/108

CHINA TO INSTALL COMPUTER SYSTEM TO COMBAT CREDIT CARD FRAUD

HK200659 Hong Kong HONG KONG STANDARD in English 20 Mar 85 p 5

[Text] A new computer system to combat fraudulent use of credit cards will be introduced in three major Chinese cities shortly.

It will be the first time that China is adopting advanced Western technology to fight economic crimes which have become prevalent in the country in recent years.

The machines will be supplied by the world's computer giant, IBM. They will be jointly purchased and used by eight Hong Kong-based banks and a visa card company and their counterparts in China.

It is hoped the computers could be put into operation before the opening of the Spring Export Commodities Fair in Guangzhou next month when many foreign businessmen will be in the country.

It was learned that the computers will be first brought to Hong Kong for tests before they are installed in Beijing, Shanghai and Guangzhou.

The eight local banks and the visa card company have already set up a joint committee with their Chinese counterparts to deal with credit card frauds.

Under their plan, a checking centre will be set up in each of the cities to provide information on the validity of credit cards presented.

The facilities will speed up the procedures of checking credit cards in such a way that they will update the current practice of using telex for acquiring data.

In future, individual outlets can obtain the necessary information to check a credit card through wireless calls to the centre of their own city.

A Chinese newspaper recently accused economic criminals outside China of taking advantage when China is trying to provide credit card services to visitors even though it doesn't have an efficient system to check the validity of the cards and credit limits.

CSO: 4010/118

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